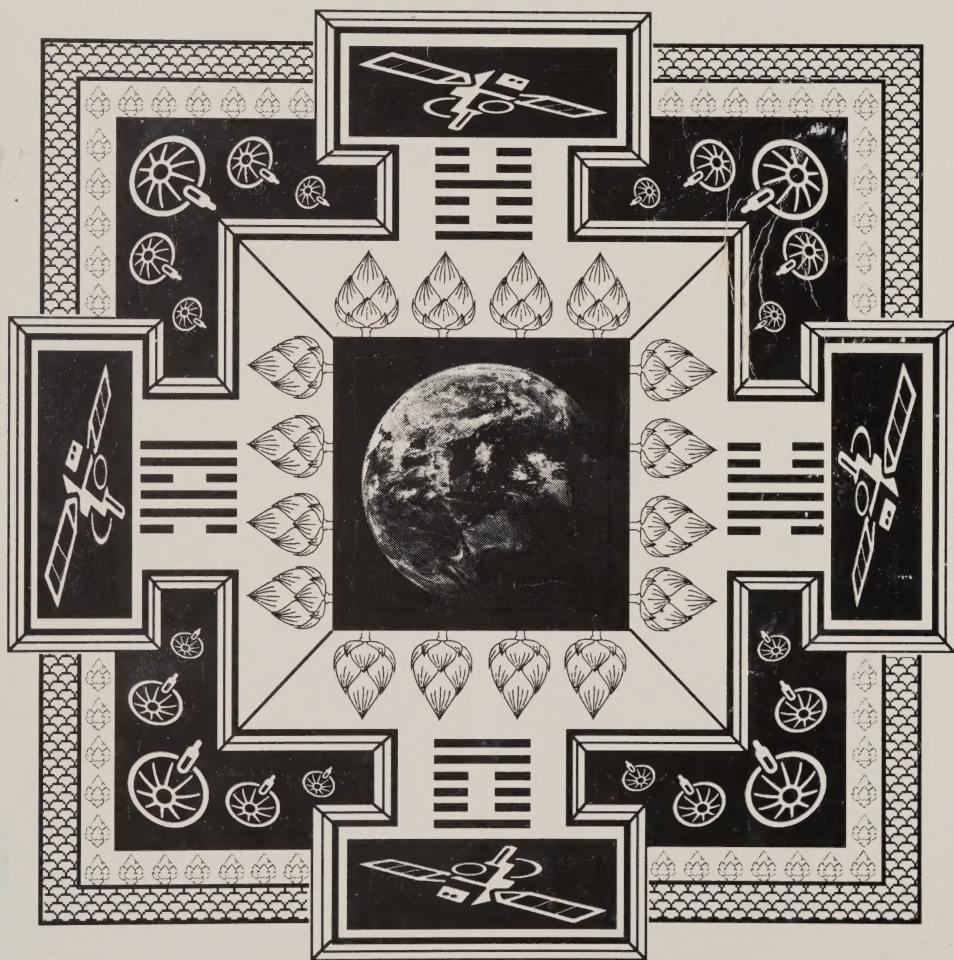


'94/95 ASIA/PACIFIC SATELLITE BUSINESS DIRECTORY

Compiled by the Staff of the
World Satellite Almanac



PUBLISHED BY MLE INC

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And, for ultimate performance and convenience, we offer matched sets of feedhorns and LNBs: **PowerPak™** for C-band, and **Corotor®Pak** for C- and Ku-bands.

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Ku Wideband
LNB (Model A)

Ku Wideband
LNB (Model B)

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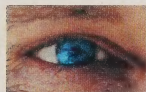
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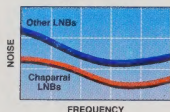
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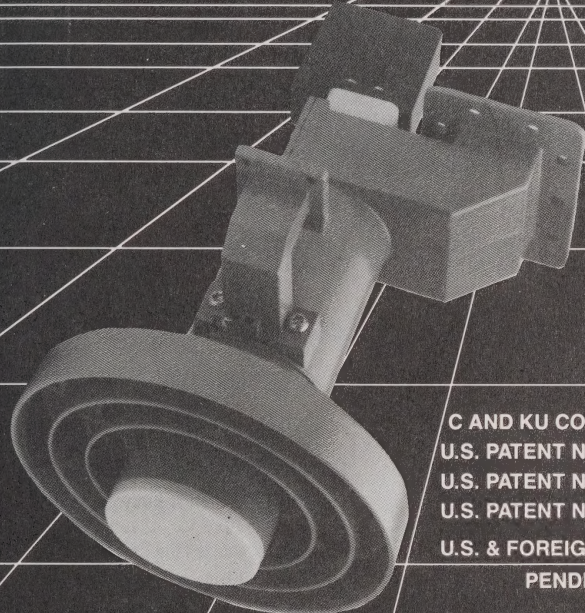
Chaparral LNB noise temperatures average less than competitors' in real tests.

2 Proven. Every LNB is tested, burned in for 24 hours at 50°C, then tested again. Sample units undergo vibration, shock, rain, and temperature cycling tests.

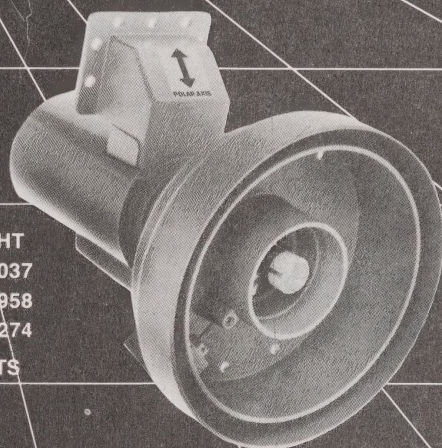
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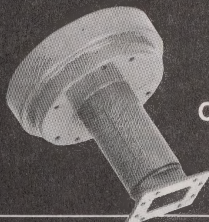
RPI-CKU Feed

**C AND KU CO-BORSIGHT
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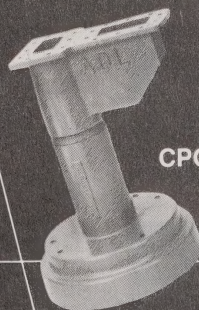
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RP1-CP400



CP-300

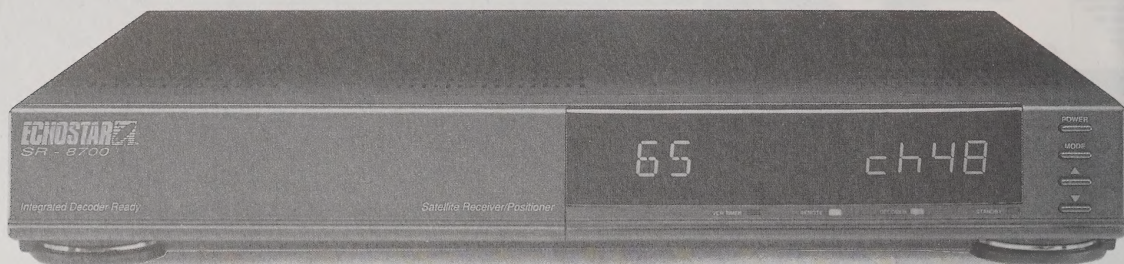


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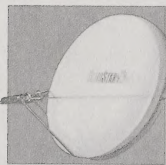
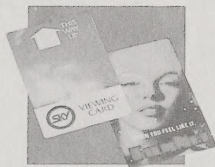
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About the cover. The Satellite Mandala which appears on the front cover of this book contains four hexagrams or “khua” from the **I Ching**: the ancient Chinese Book of Changes.

Top: The Arousing Thunder

Shock is an important and beneficial teacher. When the thunder rolls and spreads terror for hundreds of miles around, do not resist it. Rather, open one’s mind and accept shock as the teacher of a definite lesson which needs to be learned. Remain composed and reverent in spirit. When a man discovers within his heart the true nature of fear and trembling, the terror produced by outside influences no longer has any power over him and true understanding is deepened. This is the spirit that leaders must strive to attain—a profound inner sense of purpose from which all outer terrors glance off harmlessly.

Left: The Gentle Penetrating Wind

The penetrating quality of the wind is an influence that never ceases. This is what makes it so powerful: time is on its side. While a surprise attack may be more astonishing, the results won by the Gentle Penetrating Wind are more enduring and complete. To achieve such effects, however, one must have a clearly defined goal, for only when the penetrating influence always works in the same direction can the desired end result be attained.

Right: Duration

Duration requires a continuous state of movement, for lack of activity takes one backwards rather than forward. This self-contained and self-renewing movement of an organized, firmly integrated whole obeys immutable laws and begins anew at every ending. The inward breath brings a fresh start. The outward breath signals expansion.

Heavenly bodies personify the state of Duration as they move in their fixed orbits. Their light-giving power endures. Likewise, Duration gives the dedicated man an enduring meaning to his life.

Thunder rolls, and the wind blows; while their extreme mobility seems to exemplify the very opposite of Duration, the laws governing their coming and going endure. Independence must not be based on a rigidity and immobility of character. One must remain aware of the times and change with them. That which endures is the unswerving directive. The inner law of one’s being, which determines all outward actions.

Bottom: Increase

Sacrifice on the part of those above for the benefit of those below fills the people with joy and gratitude. As a result of a leader’s generosity in thought and action, the people will become fully devoted. Once this has been achieved, anything is possible, and even difficult and dangerous undertakings will succeed.

As thunder and wind strengthen each other, so must leaders of men strengthen themselves. Seek the good in others and imitate it; upon discovering inferior qualities within, eliminate them.

The time of Increase resembles the marriage of heaven and earth. The power of heaven descends to embrace and invigorate the earth, thereby generating and bringing forth new life. Because the time of Increase will not endure, it should be put to great purpose while it lasts.

Chapter One:

Asia/Pacific Year In Review

December, 1992- December, 1993

THE YEAR IN REVIEW - DECEMBER, 1992

Optus B2 Lost In Space

On December 21, 1992, Australia's Optus B2 satellite was launched from China via a Long March II rocket. However, after separation of the satellite from the launch vehicle, all attempts by the Optus telemetry and tracking earth stations to communicate with the spacecraft were unsuccessful and the satellite was declared lost.

The original contract between the Australian satellite owner and Hughes Aircraft Company called for the in-orbit delivery of two second-generation Aussat B satellites. Optus B1 was launched into geostationary orbit in the Fall of 1992. With the loss of Optus B2, however, Optus Communications was forced into implementing an inclined orbit plan for the first-generation Optus A2 satellite which was nearing the end of its conventional mission lifetime.

In the Fall of 1992, Optus put forward an inclined orbit plan which drew the unmitigated ire of many of its satellite customers. At that time, Optus sought to prolong the life of Optus B2 by placing it in a five-year storage orbit following its launch. Continued use of the Optus A2 satellite would have been gained by maintaining the older satellite in an inclined orbit. Following a deluge of complaints, however, Optus subsequently withdrew the inclined orbit plan in favor of operating Optus B2 immediately. With the loss of Optus B2, Optus Communications has been forced into implementing its inclined orbit plans for Optus A2 because it would be at least two years before Hughes could build and launch a replacement satellite.

GTE and Chinese CNPTAC Close Deal for Spacenet I

GTE Spacenet and the China National Postal and Telecommunications Appliances Corporation (CNPTAC) have signed a contract for the sale of

GTE's Spacenet I satellite for use by the China Telecommunications Broadcast Satellite Company (China-Sat).

GTE Spacenet currently has a fleet of nine communications satellites including Spacenet I, which is principally a C-band satellite, with eighteen C-band and six Ku-band transponders.

Spacenet I was GTE Spacenet's first satellite, launched by Arianespace on May 22, 1984. Spacenet I, currently located at 120 degrees West Longitude, will be flown to its new orbital assignment of 115.5 degrees East Longitude in the first quarter of 1993. The spacecraft will fill in for the new DFH-3 satellite which was delayed due to export restrictions imposed by the United States. DFH-3 is expected to be launched in 1994.

Russia's GIS Announces New Ku-Band Satellite Plans

At the *Asia/Pacific Satellite & Cable Summit* held in Hong Kong in December of 1992, a new Russian satellite manufacturing consortium composed of several leading Russian space technology companies announced its plans to launch a series of innovative Ku-band satellites beginning in 1994. According to Global Information Systems (GIS) officials, the new spacecraft will carry sixteen Ku-band transponders, with each transponder capable of independently transmitting via its own steerable spot beam. Contours and power levels can be adjusted while in orbit to fulfill the specific needs of each customer. The announcement was made in light of the company's plans to market satellite capacity to potential users in Asia.

The GIS system will consist of three satellites in geostationary orbit, two of which will be receivable from locations in Asia. Although the primary function of the "Koupon" satellites will be serving the Russian banking industry, excess capacity will be made available to customers outside of Russia and the C.I.S. To market this capacity, GIS has formed a joint venture with Manila-based Communication and Broadcast Managers, Inc., called Galaxy Satellite and Telecommunications, Ltd. Officials for this Hong Kong-based venture say that the company will invest more than US\$ 60 million as well as seek additional outside funding.

Ariane Launches Superbird A, Signs New Contract for BS-3N

On December 1, 1992, Arianespace successfully launched the new Superbird A satellite for Japan's Space Communications Corporation (SCC). The launch vehicle was an Ariane 42P, fitted with two solid strap-on boosters. Superbird A is the fourth satellite launched by Arianespace for Space Communications Corporation since June of 1989, two of which failed in orbit. Built by Space Systems/Loral of Palo Alto, California, Superbird A (158 Degrees East Longitude) had a weight at lift-off of 2,780 kg. The payload consists of twenty-three Ku-band transponders and three Ka-band transponders.

Superbird A, the second of a two-satellite constellation, became fully operational in February of 1993. Superbird B was launched in February of

1992 and has been providing service since April 6, 1992.

On December 15, 1992, Arianespace announced the signing of the contract with GE Astro - Space (now Martin Marietta Astro - Space) to launch the BS-3N satellite which will be operated jointly by NHK (Japan Broadcasting Corporation) and JSB (Japan Satellite Broadcasting, Inc.). This spacecraft will be launched in early 1994 by an Ariane 4 rocket from the Kourou Space Center in French Guiana, South America.

The BS-3N spacecraft is a three-axis stabilized, three-channel direct broadcast satellite with a liftoff mass of 1200 kg (2650 lb). The satellite will be used to deliver direct-to-home TV and audio services in Japan.

THE YEAR IN REVIEW - JANUARY, 1993

ComStream to Provide Chinese with Digital Network

The first digital audio broadcast network on the Chinese mainland will be manufactured and installed by ComStream Corporation. The contract, signed with the Chinese Ministry of Radio, Film and Television (MRFT), initially calls for audio to be uplinked from Beijing and broadcast to three receiving sites within Guangdong Province. Over the next two to three years, the broadcast system will carry music, entertainment, and news into fifteen provinces with hundreds of receiving sites.

Guangdong Province, adjacent to Hong Kong, is the fastest-growing economic region in the world with 20 to 25 percent annual growth. Officials with the MRFT indicated a desire to keep pace with the high level of technical growth in the region by selecting a digital audio network that could provide listeners with the level of sound quality they have come to expect. The ComStream network can transmit CD-quality stereo in 128 kb/s of bandwidth, using the latest ISO/MPEG standard (MUSICAM) digital compression techniques.

This first MRFT audio network is configured to transmit three full stereo channels, each at 256 kb/s. ComStream equipment encodes and compresses the signal at MRFT headquarters in Beijing and then transmits the signals from a 5m hub antenna. Receiving sites at Guangzhou, Shenzhen, and Zhongshan use 5m antennas to receive the signal, and then use the ComStream ABR200 Digital Audio Receiver to decode the programming for retransmission over terrestrial AM or FM stations.

The MRFT has dubbed the network as "Pioneer" because a follow up is planned immediately, with ComStream equipment established as the audio standard. Plans call for another fifty-node network to be delivered to Xinjiang Province by May, 1993. Also, by the end of 1993, Shanxi Provincial Broadcast will be implementing a similar system, and the Guangdong network will be adding several more receiving sites.

IDB To Supply Chinese Uplinks

IDB was awarded a US\$2 million contract to its IDB Systems unit by the Ministry of Post and Telecommunications (MPT) of the People's Republic of China, to provide two C-band transportable earth stations. The Chinese subsequently used the two earth stations to broadcast the Asian Games in the Spring of 1993. Both transportable earth stations are capable of operating via the INTELSAT satellite system as well as the Chinese domestic satellites.

THE YEAR IN REVIEW - FEBRUARY, 1993

Arianespace to Launch INTELSAT VIII Satellites

Arianespace has announced the signing of a launch contract for two new generation INTELSAT VIII satellites. The two satellites will be placed into orbit in 1996 using Ariane 4 launch vehicles to be deployed from the Kourou Space Center in French Guiana.

INTELSAT 801 and 802 will be built by Martin Marietta Astro - Space of Princeton, New Jersey. INTELSAT VIII satellites will have a liftoff mass of 3,700 kg (8140 lb) and a sixteen-year service lifetime. The satellites, which will carry six Ku-band and thirty-eight C-band transponders, are being designed to serve INTELSAT users in the Pacific Ocean Region. The new contracts bring the total to six INTELSAT satellites to be launched by Arianespace in the next three years, starting in October of 1993.

INTELSAT Acquires Options for Russian Express Satellites

INTELSAT and Informkosmos (which markets Russia's forthcoming Express series of communications satellites) entered into an agreement which grants INTELSAT the option to lease up to three Express satellites, with the first satellite capacity available in mid-1994.

Informkosmos was established by the Russian Federation to design, control, manufacture, own, and finance the Express satellite series. Each Express satellite leased by INTELSAT will have ten 36 MHz C-band transponders and two 36 MHz Ku-band transponders.

Asiasat & China Great Wall Sign Launch Contract

Asia Satellite Telecommunications Co., Ltd., (AsiaSat), has signed a launch service contract with China Great Wall Industry Corporation (CGWIC) for the launch of the AsiaSat 2 communications satellite using the Long March II-E launch vehicle.

The launch is scheduled in the first quarter of 1995 from the Xichang launch site. On April 17, 1990, CGWIC successfully launched the AsiaSat 1 satellite using a Long March 3 launch vehicle. AsiaSat 2 is a GE7000 series satellite manufactured by Martin Marietta Astro - Space. The satellite will be launched into the orbital position of 100.5 degrees East Longitude.

Nintendo to Try Satellite Delivery of Video Games

The world's first satellite-delivered video games have been promised to Japanese households early in 1994 by the games giant Nintendo. Nintendo plans to use satellite capacity it has acquired to beam the games directly to Japanese homes, thus making interactive games more feasible, and enabling a player to access a central library of games via satellite or telephone lines. Subscribers will then be able to play live opponents over an interactive games network.

The first satellite-delivered games, however, will be relatively simple: one is expected to be a quiz game, with the questions beamed into users' game computers; the other, a battle game, will turn on users' computers at the beginning of a tournament and shut them down at the end of the tournament. Players, however, will have to take pictures of their television screens and submit them to Nintendo dealers to claim prizes.

Nintendo entered the satellite-delivered game business through its 19.5 percent share in Satellite Digital Audio Broadcasting Co., which broadcasts via the Japanese BS-3A satellite. The two companies will develop an adaptor and decoder that will enable Nintendo game computers to access the satellite signal.

INTELSAT To Provide Additional Asia/Pacific Coverage

Even though the INTELSAT VII and VII-A satellites have yet to be launched in the Asia-Pacific Region, and the first INTELSAT VIII series have yet to be built, INTELSAT has announced plans to purchase yet another series of communications spacecraft. The so-called "Landmass" satellites, placed at 91.5 and 95 degrees East Longitude, will serve the growing market in the Asia/Pacific Region.

THE YEAR IN REVIEW - MARCH, 1993

FCC Grants Extension to Columbia Communications

On March 5, 1993, the U.S. Federal Communications Commission ruled that the privately-owned international satellite (TDRS) operator Columbia Communications Corporation had made substantial progress toward launching its own satellite in the Pacific Ocean Region. The FCC granted the company an extension of time to demonstrate second-stage financial qualifications to construct, launch, and operate a new international satellite communications system. When launched, Columbia's new satellite will be located at 165 degrees West Longitude. In granting the extension, the FCC said that Columbia had shown "a substantial effort...in obtaining operating agreements, customers, and a certain level of financing for all of its proposed operations."

Papua New Guinea Begins New INTELSAT Service

On March 3, 1993, the Post and Telecommunications Corporation (PTC) of Papua New Guinea initiated its first IBS carrier, between Lae, on the Northeast coast of Papua New Guinea, and Sydney, Australia. The service links Collins & Leahy, a merchandizing company, with Computer Sciences of Australia, using the INTELSAT 511 Pacific Ocean Region satellite at 177 degrees East Longitude.

Hughes to Build Palapa C Satellites for Indonesia

Continuing a business connection that spans two decades, Hughes Aircraft Company has signed an agreement to build third generation Palapa C communications satellites for Indonesia. The multimillion-dollar contract is between Hughes Communications International, Inc., of Los Angeles—a Hughes Aircraft subsidiary—and PT SATELINDO, a newly formed, private telecommunications company in Indonesia. Financial details were not disclosed. The agreement calls for two HS 601 three-axis stabilized satellites, plus an option for a third spacecraft. Hughes also will upgrade the master control station in Daan Mogot, outside Jakarta.

The Palapa-C satellites are scheduled for delivery in July, 1995, and January, 1996. SATELINDO has until 1999 to exercise its option for the third satellite. SATELINDO will name the launch vehicle provider at a later date.

Each Palapa C satellite will carry thirty-four transponders, thirty in C-band and four in Ku-band. The beam coverage area will include not only Indonesia, with its 13,000 islands, but also Southeast Asia and portions of China and Australia.

Shangri-La Signs with Global Information Systems

GloboStar Satellite Systems Ltd., the international marketing representative of Russia's first private satellite system, Global Information Systems Inc. (GIS), has signed a memorandum of understanding with Shangri-La Channel (Pvt) Ltd., Nepal's private TV station. Shangri-La plans to use the first GIS Koupon satellite following its launch in February, 1994.

The primary project for GIS is the "Bankir Network," which will provide a communications network to Russian and CIS banks using Koupon satellites and VSAT terminals. This network began operations in 1993 using existing Russian satellites. GIS expects that within two years, there will be three Koupon satellites providing complete coverage of Russia and the CIS.

Shangri-La will be setting up cable and pay television networks, commencing this year in Kathmandu and expanding to all the major towns of the mountainous Kingdom of eighteen million people. Shangri-La will set up an uplink station in Kathmandu and eventually twelve hours of Shangri-La programming will be available throughout Nepal and in Nepalese communities located in neighboring India. Reception will be possible using antennas which are 1m in diameter.

The use of digital compression video is being considered with the possibility that Nepal Television and other planned private TV networks for the Indian subcontinent can share the transponder. GloboStar has appointed Shangri-La as its exclusive agent for Nepal and the neighboring Kingdom of Bhutan.

VISTA To Market SOVCAN Star Satellite Capacity

SOVCAN Star Satellite Communications, Inc., has commissioned VISTA Satellite Communications, Inc., to begin a worldwide marketing effort to lease three C-band transponders on a Stationar satellite to be located at 145 degrees East Longitude, beginning in April of 1995. These three transponders will have hemispheric, zonal, or spot beams at the option of the initial user.

SOVCAN Star is a joint venture that will supply international satellite communications through a combination of Canadian payload technology and satellite and launch expertise from Russia. SOVCAN Star will launch the satellite and provide commercial service during 1996. This joint venture is between government agencies of the Commonwealth of Independent States, a Russian commercial enterprise, and four Canadian corporations. Nauchno Proizvodstvennoe Obiedinenie Prikladnoi Mekhaniki (NPO PM) is the only Russian company which designs, manufactures, tests, launches into orbit, and operates communication and navigation satellites. Since 1975, NPO PM has designed and placed into service over sixty communications satellites in geosynchronous orbit. NPO PM will provide the Tracking, Telemetry, and Control (TT&C) for the satellite.

The Canadian firms involved in the joint venture are: COM DEV, a supplier of multiplexing and switching equipment for communications satellites; CANCOM, a provider of television signals to almost 3,000 cable systems, serving almost 3,000,000 remote Canadians by cable and providing direct-to-home services to those beyond the reach of cable; Spar Aerospace Limited, which designs, develops, and manufactures satellites; and General Discovery Canada, which promotes commercial projects between Canadian companies and CIS governments and enterprises.

NHK/Japan Satellite Broadcasting to Buy BS-4S Satellite

NHK, the government-owned broadcasting system of Japan, other backers such as Japan Satellite Broadcasting, Inc., of Tokyo, five other Tokyo-based broadcasters, and eight banks have joined in a consortium called the Broadcast Satellite Service.

The new consortium is developing a five-year plan to purchase and launch two BS-4 direct broadcast satellites by 1998, which will replace NHK's existing BS-3A and BS-3B satellites. The new satellites will be Ku-band direct broadcast satellites with four channels each.

Tokyo Broadcast System Signs with IDB

IDB has entered into a new five-year agreement with Tokyo Broadcast System (TBS) for the provision of full-time television service between the United States and Japan. IDB began providing service to TBS in April of 1991.

Under this agreement, IDB will continue to provide TBS with full-time, twenty-four hours per day, international transmission of television programming services between the TBS news bureau in New York and TBS headquarters in Tokyo. Additional services will be provided on an occasional basis to other TBS news bureaus in Los Angeles and Washington, D.C.

The TBS New York Bureau's operating center will be interconnected via fiber optic lines to IDB's Staten Island International Teleport. The transmission will be routed via U.S. domestic satellite to IDB's Los Angeles International Teleport. From Los Angeles, TBS signals will be transmitted to Tokyo via the INTELSAT satellite at 180 degrees West Longitude.

THE YEAR IN REVIEW - APRIL, 1993

ARABSAT Acquires Anik D2

In April of 1993, Telesat Canada began moving its Anik D2 satellite to a new orbital position over Africa. Earlier in 1993, the Arabsat organization signed an agreement with Telesat Canada governing the sale of the Anik D2 C-band communications satellite. Anik D2 was initially designed to serve as part of Canada's domestic satellite system. Beginning in December of 1991, however, the satellite was used by GE Americom to replace the ailing Satcom F4R satellite. With the successful launch of its new generation Satcom C3 and C4 satellites, GE no longer required the use of Anik D2.

On April 1, 1993, control of the spacecraft was returned to Telesat Canada. Telesat subsequently drifted the satellite to the new orbital assignment of 19 degrees East Longitude where it arrived on station in August of 1993. Following a comprehensive technical check-out by Arabsat and Telesat, the satellite was placed into operational service.

Renamed Arabsat 1-D, the satellite began operations in an inclined orbit mode from day one at its new assigned position. Telesat expects that the satellite will remain functional through the end of 1995—long enough for Arabsat to launch the first of its new generation Arabsat II dual-band (C/Ku-band) spacecraft.

Telesat's contract with Arabsat includes Telesat's supply of Telemetry, Telecommunications, and Command (TT&C) services. While the TT&C facility will be physically based in Tunis, Telesat will maintain direct control through computer links to Telesat's control center in Toronto, Canada.

Arabsat was forced to take this interim measure because of the premature loss of fuel experienced by its Arabsat 1-A and 1-B satellites, which occurred last year—even though the use of the Comsat Maneuver was supposed to extend the operational lifetimes of the two satellites by several additional

years. Experts believe that the cause of the twin failures was due to fuel mismanagement. By allowing Telesat Canada to maintain control of the spacecraft, Arabsat ensures that the satellite will be maintained by a knowledgeable technical staff with plenty of experience in flying spin-stabilized spacecraft.

Arabsat 1-D will provide supplemental capacity for Arabsat 1-C which, at the time of writing, was fully loaded with television and telephony traffic. Reports from the region indicate that Arabsat 1-D will provide several transponders for the transmission of Compressed Digital Video (CDV) services.

Arabsat 1-D is a standard twenty-four transponder C-band satellite based on the immensely successful Hughes HS 376 platform. Each transponder is capable of transmitting 960 one-way analog voice circuits or one conventional TV signal. Powered by 11.5 watt TWTAs, the satellite's single C-band beam has been tilted South to cover Northern Africa and the Middle East with a nominal EIRP of 36 dBW.

THE YEAR IN REVIEW - MAY, 1993

Shanghai Stock Exchange Buys ComStream Network

The Shanghai Stock Exchange (SSE) is installing two parallel, 1,000 site ComStream satellite networks for broadcasting digital data and audio to SSE member brokers. Signed on May 15, 1993, the contract is with NCL Enterprise Company, the Hong Kong affiliate of SSE. The Shanghai Scientific and Technical Development Company will conduct the installation and the operation of the network. The system is expected to be completed before the end of 1993.

The network is being created to deliver solid data and information to SSE-licensed traders whose numbers have been increasing all over China. Future plans call for expanding overseas and adding an interactive data network.

The new SSE network will place ComStream DBR401 digital data receivers and ABR200 Digital Audio Receivers at all brokerage offices in China. The data broadcast will include real-time stock information and prices, while the audio will bring another dimension in the form of profiles of traded companies, analysis of stock trading, information on how to buy stocks, business news, and music.

Separate data and audio uplinks will be located at the SSE in Shanghai. Data rates are 19.2 kb/s for data and a single 256 kb/s stereo compressed digital audio channel.

Shanghai Metals Exchange Buys ComStream Network

On May 14, 1993, the Shanghai Metals Exchange (SME) signed a contract with ComStream Corporation for a satellite data broadcast system. The network will initially broadcast trading data to fifty-two sites across China, with expansion planned upon completion of the first phase.

Data will originate from an uplink at the SME trading pit. The beginning data rate is 19.2 kb/s, but ComStream data broadcast products feature user-selectable rates. In this way, the network capacity can be easily expanded in the future.

IDB To Provide India With Digital Private Line Services

IDB WorldCom has announced the inauguration of new digital private line service direct to Bangalore, India. IDB has signed an exclusive agreement to provide direct digital private line services to a few selected cities in India with Software Technology Parks of India (STP), a newly-created scientific society of the Department of Electronics, Government of India.

Under the agreement, IDB will provide digital private line services to STP locations in Bangalore and Hyderabad, with discussions under way for service to Trivandrum. STP has launched high-tech industrial parks at these locations as part of a new program sponsored by the Indian Government, to promote the expansion of the country's high concentration of software expertise.

STP Bangalore has developed "SoftNET," a unique network to offer Value Added Network services such as Point-to-Point Digital Private line, commercial IP and Packet Switched (X.25) services to software exporters. The service is provided utilizing an INTELSAT Indian Ocean satellite system interconnected with digital fiber optic facilities jointly owned by IDB and Netherlands PTT.

Service to Bangalore currently is operational. The customer list includes IBM/TATA Systems; Wipro Systems/Geisco; Verifone; Digital Equipment India Limited; Motorola; and Hewlett Packard, among others. STP Bangalore also has joined with SprintNet to offer IP and X.25 services to small-scale exporters from Bangalore. Service to Hyderabad became operational in June of 1993. Customers include Control Data Corp., Intergraph, Inc., and Satyam Computers.

THE YEAR IN REVIEW - JUNE 1993

ComStream Expands Chinese Audio Network

ComStream Corporation has signed a contract with the Xinjiang Broadcasting Bureau to provide a satellite digital audio network similar to the "Pioneer" network previously installed between the Beijing and Guangdong Provinces. A key feature of this new network is the ability of multiple channels to send music, entertainment, and news from central studios to several provincial radio stations in the various native dialects of each region. The audio is then broadcast to listeners over terrestrial AM or FM stations.

The new network will carry six mono channels and one stereo (256 kb/s) channel from the provincial capital in Urumqi. Each of the six mono channels will carry broadcasts in one of the region's minority dialects, such as Uyghur or Kyrgyz, spoken within the isolated valleys and plains of the

Province. The first phase of installation will include fifty receiving sites, with expansion planned to more than 100 sites.

Keystone Reduces Tariffs on K2 Skylink Service

Keystone Communications has reduced tariffs for its K2 Skylink satellite service between North America and Asia. K2 Skylink is the first full-time circuit for occasional video between the United States and Japan. In June of 1993, K2 Skylink expanded to become a major provider of transpacific video services for broadcasters on both sides of the Ocean by adding an Eastbound service from Asia to North America.

In its first year of operation, K2 Skylink provided transmission services for all of the Japanese TV networks—NHK, NTV, TBS, Fuji, Asahi, and TV-Tokyo, as well as providing services for the Japan Satellite Broadcasting Company (JSB). Other K2 Skylink clients have included advertising and PR companies such as Leo Burnett and Hill & Knowlton from the United States and Videocom in Japan. Since the services expanded to reach other countries in January of 1993, new clients such as Hong Kong's STAR TV and Taiwan's CTV and CTS networks also have been added.

N-Star Passes Design Review

Space Systems/Loral's new N-Star telecommunications satellite for Japan's Nippon Telegraph & Telephone Corp. has successfully completed its critical design review, moving the program from the design to the manufacturing phase.

The recent review covered all elements of the spacecraft design and performance characteristics, including the N-Star communications payloads and the attitude control, telemetry and command, power, propulsion, thermal, and structural subsystems.

Space Systems/Loral is building two N-Star satellites to be delivered in orbit in 1995. The company expects to conduct the satellite ground test and final design review in late 1994.

The N-Star satellite is one of the most versatile communications payloads now under development, featuring five communications systems operating on four frequency bands to serve telephone network needs throughout the Japanese Islands. With a design life of more than ten years, the satellites are expected to provide fixed and mobile telecommunications services until the year 2005.

New Asian Satellite TV Alliance Announced

In a move to advance their goal of creating an alliance among the region's most influential satellite networks, leading international programmers TVB International of Hong Kong, Turner Corporation, and HBO Asia will coordinate efforts in regards to establishing a common satellite signal encryption and compression system for all Alliance member services in Asia.

The alliance of programmers, currently leasing transponders on the

Indonesian Palapa B2P satellite, also has signed or is about to sign a transponder reservation agreement with Apstar-1. Scheduled for launch in mid-1994, Apstar-1 will serve Papua New Guinea, Hong Kong, Thailand, Singapore, the Philippines, Malaysia, Indonesia, and other countries in Southeast Asia.

Members of the group also intend to cooperate on a number of policies—including the investigation of distribution methods in each country—targeting CATV, SMATV, MMDS, and UHF retailers. They will work with retailers to insure that satellite dishes and electronics are in place to receive signals from Palapa and any other satellite these programmers may use in the future.

JBTv Unveils MPEG Compression Technology

Japan Business Television (JBTv) has developed a digital video compression broadcast system which will make it possible to send four real-time video images on a single satellite transponder. This represents the first time that a Japanese company has demonstrated a real-time digital video compression broadcast system.

JBTv plans to market the system to industries such as broadcasting, business television and distance learning network users. With this system, the communication cost for Japanese satellite users would be cut to a fraction of the regular cost for satellite capacity.

The digital compression technology was adopted from C-Cube Microsystems of Milpitas, California, which manufactures semiconductors. The MPEG-2 compression standard also was adopted. The ISO (International Standardization Organization) currently is working on a standard for MPEG-2.

THE YEAR IN REVIEW - JULY, 1993

Rupert Murdoch Acquires Control of STAR TV

On July 27, 1993, Rupert Murdoch's News Corporation announced that it had acquired controlling interest in Hutchvision, Ltd., of Hong Kong, the company which is the producer and marketer of STAR TV's program lineup on the Asiasat-1 satellite. The US\$ 525 million agreement gives News Corporation a 63.6 percent share of Hutchvision's ownership. A separate company known as Hutchvision Hong Kong, which is licensed by the Hong Kong Government to uplink the STAR TV services to Asiasat, will remain in control of the Hutchinson Group.

The acquisition of STAR TV programming gives Rupert Murdoch control over a vast empire of movie, broadcast, and satellite TV services that reaches from BSkyB in Europe to the Fox TV network and Twentieth Century Fox movie studios in the United States. Murdoch's vast library of movies and TV programs should give STAR TV a major boost in its efforts to expand into the pay TV marketplace in Asia.

Spacenet I Gains New Life Over Asia

On July 16, 1993, Chinese Central Television's CCTV-1 and CCTV-2 program channels, Xixang (Tibet) TV, and Xinjiang TV began using the Chinasat-5 (formerly Spacenet I) satellite to relay their TV program services. Chinasat-5 currently is owned by China Communications and Broadcasting Satellite Co., Ltd. The satellite was purchased from GTE-Spacenet last year and moved to a new orbital assignment of 115.5° East Longitude. CCTV also plans on introducing sports and movie services beginning in 1994.

Chinasat-5 also carries Xixang People's Broadcasting Station's radio broadcasting in Tibetan service on 7.6 MHz and Chinese service on 7.1 MHz.

CCTV-1 and CCTV-2 were simulcast on Chinasat-1 at 87.5 degrees East Longitude and Chinasat-5 (Spacenet I) at 115.5 degrees East Longitude until August 15, 1993. The Chinasat-1 feeds of CCTV-1 and 2 were discontinued as of August 16, 1993.

A CCTV news program which aired on July 13, 1993, reported that China will be launching a new large-scale domestic communications satellite in the latter half of 1994—the first of the long-awaited, next-generation DFH-3 satellites.

IDB Completes Stations in China, Korea, and the Philippines

IDB Systems, the unit of IDB Communications Group, Inc., that provides engineering, design, and integration of satellite earth station facilities, has completed the installation of earth stations in the People's Republic of China, South Korea, and the Philippines.

The nine-meter earth station in the People's Republic of China is the first international Ku-band earth station for telephony in that region. This facility, which currently is providing thirty voice channels between South Korea and the People's Republic of China, is located in the coastal city of Weihai in the Shandong Province.

The system includes IDB's MACS 50 monitor and control system. The earth station operates via the INTELSAT satellite system. The contract for the earth station, valued at over US\$1 million, was signed in Beijing in September, 1992, the same week that South Korea and China announced the normalization of diplomatic relations between them.

IDB Systems also completed the installation of the first C-band earth station for digital service operating on the TDRS satellite over the Pacific Ocean. This 11m earth station will provide digital data service between South Korea and several countries. The earth station is located eighty miles South of Seoul, in the city of Pyung Taek.

IDB Systems has completed building the first C-band transportable earth station in the Philippines to use digitally compressed video. The 3.8 meter transportable system will be utilized as a satellite news gathering vehicle for the largest television broadcaster in the Philippines, ABS/CBN Broadcasting Corp. The transportable unit incorporates digital compression equipment that allows several channels, rather than just one, to share an

individual satellite transponder. The transportable earth station—which is used to access the Palapa B2P satellite—began operation on July 1, 1993.

Armenia Joins INTELSAT

On July 14, 1993, the Republic of Armenia joined the INTELSAT organization. Armenia, INTELSAT's 126th member state, has an initial investment share of 0.05 percent. The official name of the new Signatory is the Ministry of Telecommunications. Armenia is the third republic of the former Soviet Union to join INTELSAT, following Azerbaijan and Russia.

THE YEAR IN REVIEW - AUGUST, 1993

Chinasat 5 Adds New Services

On August 8, 1993, Chinese Central TV began to broadcast CCTV-3 program channel via Chinasat 5. Guangzhou's local TV station also has begun test transmissions. Moreover, Xinjiang TV expanded its service to twenty-four hours per day on August 1, 1993.

ATN Officially Launches English-language Service

On August 20, 1993, Asia Television Network (ATN) officially began offering its ATN-One English-language service to viewers throughout Asia. The service consists of variety programs produced by the U.K.'s Thames Television, and news programs of the ABC TV Network (USA). ATN also is now offering English-language news on its Hindi-language channel, ATN-Gold. ATN-One and ATN-Gold currently share the same transponder on the Statsionar 21 satellite at 103° East, with ATN-One transmitting from 13:30 GMT to 15:30 GMT, followed by ATN-Gold.

Azerbaijan Radio/TV Relocates

On August 20, 1993, Azerbaijan Radio/TV moved from Statsionar 21 to Statsionar 14 at 96.5° East using the same transponder as ATN-Two. Azerbaijan broadcasts following the conclusion of ATN-Two's program day which airs from 12:30 to 15:30 GMT daily.

INSAT II-B Takes On Direct-To-Home TV Services

Launched on July 22, 1993, Insat II-B began operations in August of 1993 at the orbital position of 93.5° East, an orbital location formally used by Insat I-B prior to its demise. On August 15, 1993—timed to coincide with India's Independence Day celebrations—Doordarshan TV began using the satellite to broadcast four TV services: DD Business—a business/news service; DD Metro—a Hindi- and English-language entertainment service; DD Music—an Indian and Western music service; and DD Sport—a dedicated sports channel. All channels start around 13:30 GMT weekdays and end around 19:00 GMT.

All services are vertically polarized with audio on 5.5 MHz subcarriers.

During daytime hours, two of the channels are used for adult literacy and professional development courses. According to India's Broadcasting Minister, Mr. K.P. Singh Deo, the new satellite channels are being launched to effectively meet the challenge presented by foreign satellite TV services such as STAR TV.

Bahrain Joins INTELSAT

On August 23, 1993, the State of Bahrain joined the INTELSAT organization. Bahrain, INTELSAT's 127th member, has an initial investment share of 0.05 percent. The country has designated Bahrain Telecommunications Company (BATELCO) to be the nation's Signatory.

Critics Charge Incompetence As Aussie Pay TV Flounders

The two top bidders for Australia's two direct-to-home systems licenses have for the sixth time withdrawn their bids before the most recent deadline of August 25, 1993, allowing the tender to fall to the two next highest bidders. It is expected that there will be several more bidding rounds before the license winners are selected.

Critics of the bidding process have charged that the government had not properly thought through the establishment of the bidding process. Companies were allowed to tender multiple bids without putting up any sort of financial guarantee, and they would easily qualify as capable of launching pay TV services for the country. Moreover, the government's repeated on-again, off-again flirtation with pay TV in recent years has only succeeded in alienating both the potential industry and the general public.

The current debacle surrounding the introduction of pay TV in Australia adds to past poor planning on the part of the government. When Aussat Pty., Ltd., was acquired by the private company Optus Communications Pty., Ltd., last year, the government reportedly included a provision in the contract calling for the reservation of multiple channels for pay TV. However, the contract was worded in such a way that Optus could interpret the agreement to mean that capacity would be reserved for multiple digitally-compressed channels which could be accommodated via a single satellite transponder. Under this interpretation, the government was forced to delay pay TV until the technology for digital compression was sufficiently developed to permit economic, large-scale introduction. The situation was further complicated by the loss of the Optus B2 satellite late last year, which left Optus short of meeting its obligations to existing Australian services.

THE YEAR IN REVIEW - SEPTEMBER, 1993

FCC Gives Green Light To New Pacific Satellite System

The FCC has granted a conditional authorization to TRW, Inc., for constructing, launching, and operating a Pacific Ocean Region (POR) satellite system at 172 degrees East Longitude. The conditional authoriza-

tion, which is subject to successful completion of consultation with INTELSAT, will enable TRW to develop a Pacific Ocean Region satellite system.

TRW plans to sell or lease capacity over PacifiCom 1 on a non-common carrier basis and to provide the direct transmission of standard video and high-definition television signals to homes using small receive-only antennas. Other TRW services will consist of private VSAT data and voice networks, private computer networks, and videoconferencing services. Granting TRW's petition, the Commission said it believes the company's proposal will provide substantial benefits to users of international satellite communications services.

Ariane To Launch Palapa C1 Satellite

The launch contract for Indonesia's Palapa C1 satellite has been signed by Mr. Iwa Sewaka, Chairman of PT. Satelit Palapa Indonesia (SATELINDO), Mr. Adi R. Adiwoso, Chairman of PT. Pasifik Satelit Nusantara (BSN) of Indonesia, and Mr. Charles Bigot, Chairman and CEO of Arianespace.

Palapa C1 will be launched in mid-1995 by an Ariane launch vehicle from the Kourou Space Center in French Guiana. It will be built by Hughes Aircraft Company. Weighing 2,989 kilograms at launch, Palapa C1 will offer thirty C-band channels and four Ku-band channels to provide both telephone and television transmission services.

Spar To Provide HK Data Comm With Broadcast System

Spar Communications Group (SCG) has signed an agreement with Hong Kong Data Communications, Ltd. (HK Data Comm) to provide a satellite financial information data broadcast system. The new system will transmit real-time information such as commodity trading indexes, real estate transactions, and other financial data from the Hong Kong Stock Exchange, Reuters, Associated Press (AP), and the Chinese Stock Market to brokerage firms, corporate investors, and traders throughout the Asia-Pacific Region.

The contract provides for a multi-channel mini-hub, 20 Spar / ComStream DBR401 receivers, and additional outdoor equipment. The hub was installed in Beijing in late August, 1993, and is operated by Guoan Electric Co., of China International Trust & Investment Corp.

The network is expected to expand quickly in the near future to several hundred sites throughout China. As the network expands, the mini-hub will be upgraded to a full-size, redundant uplink hub with more channels, higher data rates, and the ability to reach an expanded number of downlink sites.

The Spar / ComStream mini-hub is a simple, low-cost way to begin using a satellite for data broadcasts. It consists of a single modem and multiplexer combination that multiplexes up to eight, 19.2 kb/s asynchronous inputs into a single aggregate data stream, and then transmits them via the modem over the satellite. To provide backup, the operator can use two mini-hubs and perform a manual switch from one to the other, which is less expensive than utilizing a full-size redundant data uplink.

IDB/Teleglobe International Launch Project Condominium

IDB Mobile Communications, Inc., and Teleglobe International of Canada have announced that their respective Board of Directors have approved Project Condominium, a cooperative venture with Cable & Wireless, Hong Kong Telecom, Teleglobe Canada, and Morsviazspudnik, that enables IDB Mobile to offer Inmarsat's B & M next-generation digital services.

The five carriers are building two dual earth stations, one in Hong Kong and one in Laurentides, Canada. The Hong Kong earth station will serve the Pacific Ocean Region (POR) and Indian Ocean Region (IOR) and the Canadian earth station at Laurentides will serve the Atlantic East and West Ocean Regions.

Under Project Condominium, the earth stations will offer access to other carriers under multi-identification numbers and will be linked by dedicated circuits, enabling customers to access any of the four Ocean Regions from a convenient single point.

Project Condominium will accommodate up to ten Signatories and/or Inmarsat service providers by allowing them to place their own land earth station ID numbers in the earth station for an investment that is less than ten percent of the cost of a customer's own dedicated earth station.

Malaysia Moves to Curb Growing Demand for TVRO

Malaysian Information Minister Mohamed Rahmat has announced that the Malaysian Government intends to introduce three new cable television channels in 1994. Recent reports indicate that the new channels will be started as a joint venture between RTM Malaysia and the private sector. The three new channels will carry news programs from CNN and the BBC World Service Television, and sports program from Hong Kong-based STAR TV which are produced by U.S.-based Prime Sports Network. While the government has indicated a willingness to allow additional foreign TV program services into the country in the future, it has adamantly refused to relax its ban on private ownership of satellite TV dishes. In Malaysia, only the Royal Family and high government officials are legally allowed to own satellite dishes. However, the following report from an "underground" TVRO user in Malaysia suggests that TVRO is very much alive in Malaysia:

"...TVRO is very much alive, at least in East Malaysia, where the last official count put it at 23,000 with 22,000 in Sarawak. For myself, I have a sixteen foot dish and a Seavey C/Ku feedhorn, but because of the official interest in these antennas, I have lowered my installation to the point where I can no longer view INTELSAT at 177 degrees East Longitude and therefore I now...watch mostly Palapa B2P and Asiasat...."

INTELSAT Orders New Satellites

On September 15, 1993, INTELSAT announced that its Board of Governors had approved the purchase of three additional INTELSAT VIII/VIII-A spacecraft from Martin Marietta Astro - Space and the lease of one Russian

Express satellite to meet growing demand for communications services on the global INTELSAT satellite system. Two additional INTELSAT VIII series spacecraft (INTELSAT 803 and 804) and one modified version (INTELSAT VIII-A/INTELSAT 805) will be ordered; options for additional VIII or VIII-A satellites may be exercised by March of 1994. The INTELSAT 803 and 804 spacecraft will meet the needs of INTELSAT users in the Indian/Asia-Pacific and Eastern Atlantic Ocean Regions, respectively, for improved C-band coverage and service. With the highest C-band power level ever for any previous INTELSAT satellites, INTELSAT 803 and 804 each will provide six global beam transponders, twelve hemispheric beam transponders, and twenty zone beam transponders. These satellites also have Ku-band spot beams that can be steered between high-traffic areas according to demand.

The modified INTELSAT 805 land mass satellite will feature expanded C-band and Ku-band coverages and other technical enhancements to increase its effectiveness to customers in the Asia/Pacific Region. For instance, INTELSAT 805 will have a minimum C-band EIRP of 36 dBW and fully-maneuverable Ku-band beams that will cover all of China, Korea and most of Japan. Also, for flexible response to market requirements, INTELSAT 805 will be able to provide circular or linear polarization via C-band frequencies.

INTELSAT also agreed to lease an Express satellite from Russia's Informkosmos for a period of five years beginning in June of 1994. The Express spacecraft has ten 36-MHz-wide C-band and two 36-MHz-wide Ku-band transponders which will provide short-term satellite capacity to meet increasing demand for INTELSAT satellite services in the Asia-Pacific Region. The Board exercised the first of three options previously negotiated between the two organizations.

The Federated States of Micronesia Joins INTELSAT

The Federated States of Micronesia has joined the INTELSAT organization, becoming INTELSAT's 128th member. Micronesia has an initial investment share of 0.05 percent. The country has designated Telecommunications Corporation to be the nation's Signatory.

Asiasat & Shinawatra Resolve Orbital Conflict

As a result of the coordination meeting between the Administrations of Thailand and the United Kingdom—represented by the Hong Kong Office of the Telecommunications Authority; Asia Satellite Telecommunications Co., Ltd., of Hong Kong (Asiasat); and Shinawatra Satellite Public Company, Ltd of Thailand—these governments announced their plans regarding the orbital positions for AsiaSat 2 and Thaicom 1 and 2.

Asiasat is the operator of both the AsiaSat 1 satellite—presently in operation at 105.5 degrees East Longitude—and the AsiaSat 2 satellite, presently under construction. Shinawatra Satellite Public Company Limited is the operator of the Thaicom 1 and Thaicom 2 satellites, also presently under construction.

According to this agreement, the companies announced that Thaicom 1 and Thaicom 2 will be collocated at the orbital position of 78.5 degrees East Longitude and AsiaSat 2 will be located at 100.5 degrees East Longitude. As part of the agreement, Asiasat and Shinawatra agree not to cause harmful interference to each other's satellite systems.

China Announces Satellite Dish Ban

The People's Republic of China's ban on home satellite dishes has thrown a monkey wrench into the marketing plans of major satellite TV manufacturers and distributors. Many observers believe that the ban was the direct result of China's failure to obtain the rights to the Olympic Games in the year 2000. Perceiving that the West was spurning its Olympic offer, China decided to strike back at both the foreign media, which had run negative press coverage of their effort to obtain the games, and Western manufacturers and program providers, who were eyeing the Chinese market for the importation of consumer electronics products and program services. At the time of writing, individuals are prohibited from owning satellite dishes. Only work units which have received official permission will be allowed to buy or import satellite receiving equipment.

An estimated 500,000 home satellite dishes already had been sold in China, with approximately 2,000,000 homes receiving foreign satellite TV programs through SMATV and cable. Moreover, sales of new TVRO systems had been exceeding 10,000 units per month. Now everything has come to a screeching halt as the government has ordered all unapproved systems to be dismantled. However, just how enforceable the ban really is remains to be seen, especially now that many areas of China have the technical capability of producing satellite reception equipment without the need for importation.

THE YEAR IN REVIEW - OCTOBER, 1993

INTELSAT 701 Begins In-Orbit Testing

Launched on October 22, 1993, by an Ariane 44LP rocket, the first of the INTELSAT VII series of telecommunications spacecraft has reached geosynchronous orbit. In-orbit testing lasted until mid-December, with commercial service scheduled to commence in January of 1994.

INTELSAT 701—a powerful satellite designed to expand telecommunications throughout the Pacific Ocean Region—will serve as INTELSAT's primary Pacific Ocean Region (POR) satellite for transpacific and regional Asia-Pacific telephony. To be located at 174 degrees East Longitude, INTELSAT 701 also will carry a significant amount of INTELSAT Business Service (IBS) traffic (for private line applications) and occasional-use television, employed heavily by broadcasters to send news or other programming on an as-needed basis.

Hughes To Build JCSat 3

Hughes Aircraft Company and Japan Satellite Systems, Inc. (JCSAT), have signed a multimillion-dollar contract for the construction and launch of a high-power communications satellite, concluding negotiations begun in 1992. The spacecraft, known as JCSat 3, will relay voice, data, and television signals to Japan, and have multiple beam coverage extending West to India, South to Australia and New Zealand, and East to Hawaii. The satellite, which will have a lifetime of twelve years, is designed with four beam antennas. The two four-panel solar wings will provide 4,500 watts of power for twenty-eight Ku-band and twelve C-band transponders.

As part of the agreement, Hughes has signed a contract with General Dynamics Corp., to launch the satellite aboard an Atlas 2-AS rocket in August of 1995. Hughes also is providing additional equipment for the JCSat satellite control stations in Yokohama and Gumma.

China Orders CLI Video Conferencing Products

The Ministry of Posts and Telecommunications, the China Transportation and Telecommunications Center, and The Customs House of the People's Republic of China have placed orders totaling US\$ 3.5 million for CLI's videoconferencing products. Two contracts call for Compression Labs, Inc. (CLI) videoconferencing systems to be used by the government's telecommunications authority, to communicate to thirty-two provinces throughout the country. In addition, the Customs House has chosen CLI's Eclipse systems and Multipoint 2 controller units for their videoconferencing network.

Tonga and Indonesia Settle Satellite Dispute

Tonga and Indonesia have settled their dispute over the 134 degrees East Longitude orbital position. Both sides have agreed not to cause radio interference with each other's collocated satellites. Palapa Pacific-1 is owned by Indonesia's Pasifik Satelit Nusantara, and Tongastar 1, a leased Russian Gorizont satellite, is operated by Rimsat Ltd., of Ft. Wayne, Indiana.

THE YEAR IN REVIEW - NOVEMBER, 1993

Arabsat 1-D To Provide Direct-To-Home Services

This month, a new service uplinked from Tunis, known as Future TV, has made its appearance on the inclined orbit Arabsat 1-D satellite located at 20 degrees East Longitude. The new Arabic-language service offers a wide variety of English-language programming with Arabic subtitles, including regular segments devoted to U.S. mini-series and music videos.

According to reports from the recently-completed MIPCOM convention, a Middle East-based venture known as Orbit Satellite Television Network intends to launch a three-channel Arabic-language program package on the Arabsat 1-D satellite within the next few weeks, with the programming package growing to a total of twenty-one services by the end of 1994. A recent

news report in *World Broadcasting Magazine* indicated that the Rome-based Orbit Satellite Television Network will use an MPEG 2.0 digital video compression system developed by Scientific-Atlanta to squeeze multiple TV signals onto a single Arabsat 1-D transponder. The signals reportedly will be uplinked from Rome, Italy. Also in the wings: another new four-channel venture backed by European direct-to-home programmer Europlus, called Arab Radio & Television (ART).

Hughes To Build Apstar 2 Satellite

On November 22, 1993, APT Satellite Co., Ltd., of Hong Kong, signed a contract with Hughes Aircraft Company to build a state-of-the-art Hughes HS-601 three-axis stabilized satellite to be called Apstar 2. The aggressive schedule calls for launch in December of 1994.

The new satellite will be used primarily for television broadcasting. It will have twenty-six C-band transponders with 52-watt power amplifiers and six Ku-band transponders with 50-watt amplifiers. The satellite will be built to attain an operational lifetime of fifteen years.

Apstar 2 will be significantly larger and more powerful than Apstar 1—an HS-376 spin-stabilized spacecraft also being built by Hughes. While Apstar 1 will cover Mainland China, Hong Kong, Indonesia, Japan, Singapore and Vietnam, Apstar 2 will have an even greater coverage area from Europe, Russia and India for service to an estimated two-thirds of the world's population. This would require an orbital position over the Indian Ocean.

THE YEAR IN REVIEW - DECEMBER, 1993

PanAmSat Announces Prelaunch Customers for New Satellites

On December 3, 1993, PanAmSat announced that it had pre-launch agreements on the books for US\$ 958 million for future satellite capacity on its global satellite system. The announcement came six months prior to the launch of PanAmSat's PAS-2 Pacific Ocean Region satellite and more than one year prior to the launch of PAS-3 (Atlantic Ocean Region) and PAS-4 (Indian Ocean Region). The TV and radio programmers include Turner Broadcasting (USA), ESPN International (USA), Grupo Televisa (Mexico), MNet (South Africa), SABC/Sentech (South Africa), and the ABS-CBN Broadcasting Corporation (Philippines).

ABS-CBN will use PanAmSat services for Asia/Pacific and transpacific program distribution, while MNET will meet its domestic South African requirements and reach into new markets abroad. Similarly, international programmers such as ESPN, Televisa, and Turner Broadcasting will use PanAmSat satellite capacity to expand their distribution networks to cable and broadcast outlets around the world.

Asian Alliance Members Acquire Apstar 2 Transponders

Australia Television International, CNN International, ESPN International, TVB International of Hong Kong, Discover Communications, and U.S. cable TV giants Viacom Networks and Time Warner have agreed to collectively lease sixteen transponders on the Apstar 2 satellite following its successful launch in early 1995. All of these services currently have berths on Indonesia's Palapa B2P satellite. The transponder agreement is in addition to the dozen transponders previously acquired by alliance members on the Apstar 1 satellite scheduled for launch in mid-1994. Apstar-2 will give the new Alliance wider distribution in the region via a more powerful satellite.

Arianespace Launches Thaicom-1

On December 17, 1993, Arianespace successfully launched Thaicom-1 and DBS-1 (DirecTv—USA) from the ELA-2 launch pad at the Guiana Space Center near Kourou, French Guiana. The Thaicom satellite system is operated by Shinawatra Satellite Public Company, Ltd., of Bangkok, Thailand—a unit of Shinawatra Computer and Communications Company, Ltd.—established to build, transfer, and operate Thailand's domestic satellite system.

All Thai government agencies and private businesses using satellites are required to use Thaicom. Moreover, Shinawatra officials have announced that all capacity on the first satellite already has been booked, as well as twenty percent of the capacity on the second satellite to be launched in mid-1994. This includes capacity for neighboring Cambodia and Laos, to relay TV and telecommunications signals on their behalf. On November 1, 1993, Shinawatra signed an option agreement with Hughes for a third Thaicom satellite due to the high rate of early bookings.

Each Thaicom satellite has two Ku-band transponders powered by 47-watt amplifiers which can generate an Effective Isotropic Radiated Power (EIRP) over Thailand of 50 dBW. Each spacecraft also carries ten C-band transponders linked to 11-watt amplifiers, generating an EIRP ranging from 33 to 38 dBW within a broader coverage area stretching from Japan to Singapore. Because of Thaicom's relatively light electronics payload, each satellite will carry several years' worth of additional fuel, thereby achieving a nominal mission lifetime of 14.5 years, versus the typical eight to ten years achieved by other HS-376 models with more transponders. Both Thaicom-1 and Thaicom-2 will be collocated at 78.5 degrees East Longitude.

With the successful dual launch of DBS-1 and Thaicom-1, Arianespace is now promoting the launch of new SDS (SPELDA Dedicated Satellite) class satellites which have a weight of approximately one metric ton. As most of Arianespace's future launches over the next three years involve satellites with a metric weight of about three tons, SDS-class satellites could be added to these missions at a fraction of the cost of a dedicated launch. SDS-class satellites should be attractive to both new domestic satellite operators wishing to emulate Thailand, or even existing satellite operators who may

need to build and launch a satellite within a short space of time to replace defective in-orbit capacity or fulfill an unanticipated surge in demand.

Lenfest Lands Aussie Pay TV License

The Lenfest Group has acquired the rights to one of the two pay-TV licenses for Australia. Lenfest is reportedly investing in Australis Media Ltd., an Australian company which will pay the Australian government US\$ 74 million for the so-called "B" license for a four channel national pay-TV service in Australia. Lenfest reportedly will take a minority share in Australis to skirt Australia's foreign ownership restrictions on the pay TV licenses. In exchange for the substantial minority ownership, Lenfest will place its president, Gerry Lenfest, onto the Australis Board of Directors, and Australis will reimburse Lenfest for a major part of its investment through a US\$ 91 million securities issue to take place in early 1994.

Australis is best known in Australia for its twenty-five narrowcast MMDS licenses with the Australian Government. Australis intends to convert from MMDS to broadcast licenses as soon as the Australian Government will permit it so that the firm can provide a satellite/MMDS pay-TV system across Australia.

INTELSAT Plots Satellite Expansion

At the conclusion of last month's 99th Meeting of the INTELSAT Board of Governors, INTELSAT Director General and CEO Irving Goldstein announced several decisions taken by the Board of Governors to prepare for the launch of fourteen new INTELSAT satellites during the next three years.

Satellite Launch Services. INTELSAT announced the selection of Arianespace as the launch vehicle provider for two INTELSAT VIII spacecraft (INTELSAT 803 and INTELSAT 804) ordered in September of 1993. Both spacecraft will be launched by Ariane 44P launch vehicles under the terms of an existing contract with Arianespace. Scheduled for launch in 1996, the INTELSAT 803 and INTELSAT 804 spacecraft will be deployed to orbital locations in the Indian Ocean/Asia-Pacific Region and the Atlantic Ocean Region, respectively. At its next meeting in March, 1994, the Board intends to select a launch vehicle provider for the INTELSAT VIII-A spacecraft (INTELSAT 805) ordered in September, 1993, at its next meeting in March, 1994.

Satellite Deployment. The Board also approved the deployment of INTELSAT 702 in the first quarter of 1994 to 359 degrees East (1 degree West) Longitude to provide service to the Middle East, Africa, Europe, and the East coasts of North and South America. Upon replacement, INTELSAT 512—the present occupant of the 359 degrees East Longitude location—will relocate to 338.5 degrees East (21.5 degrees West) Longitude, and INTELSAT 502 will be moved from 338.5 to 319.5 degrees East (21.5 to 40.5 degrees West) Longitude.

Orbital Locations. During the next several years, INTELSAT intends to

relinquish some orbital slots and register for the use of new ones. For instance, INTELSAT operations at 63 degrees East Longitude will be transferred to 62 degrees East Longitude after the completion of the International Telecommunication Union (ITU) coordination and notification procedures for 62 and 64 degrees East Longitude. INTELSAT is taking this action—and registering the networks indicated below—to enhance regional coverage, and to create additional slots for future satellites.

The Board has endorsed Management's intent to register networks for INTELSAT VI, VII/VII-A, and VIII satellites at 62, 64, 338, and 340 degrees East Longitude; INTELSAT VII/VII-A and VIII satellites at 330.5 degrees East Longitude; and INTELSAT V-A, VII/VII-A and VIII satellites at 157 degrees East Longitude.

Chapter Two: Star Wars Along Asia's Satellite Superhighways

Although America's Strategic Defense Initiative was recently mothballed by the U.S. Government, there is another form of space-based warfare taking place these days: one that is being fought in the skies over Asia and the Pacific Rim. Communications satellites have become the synapses of our global brain, providing vital electronic links within individual countries as well as between the various nations of the world. Control of these satellites—along with the area of the skies in which they must be located—has become an essential economic prerequisite for industrialized and developing countries alike. Experts project that the sales of telecommunications equipment and services within Asia and the Pacific Rim will outstrip all other regional markets in the world by the beginning of the 21st century. This is why many countries and multinational entities are fighting for a home in the skies above Asia and the Pacific Rim.

The Battle Over The Skies

Star Wars, Asian style, currently is being waged by a cadre of satellite operators who wish to serve the region's telecommunications needs. The objects of their desire are specific points along an arc of outer space real estate which lies some 22,300 miles above the Earth's equator. As science and science fiction writer Arthur C. Clarke first pointed out in 1945, this is the only orbital plane available where a satellite's velocity will precisely match the rotational speed of the Earth as it spins on its axis. The result? Each satellite will remain anchored or "stationed" at a fixed position in the sky relative to the Earth below.

The beauty of the so-called "geostationary arc" is that transmitting and receiving stations down on the ground can point their antennas at a single spot in the sky and tap in to a never-ending stream of video, voice, and data. This vastly simplifies the technology and dramatically reduces the overall cost of establishing full-time satellite communications links.

A single geostationary communications satellite can potentially transmit into an area of the globe that is exponentially greater than that which any ground transmitter and antenna could ever cover—up to forty percent of the Earth's total surface area. It is like having a radio transmitting tower that is 22,300 miles tall! The bad news is that there are only a limited number of geostationary "parking spaces" available along the section of the satellite superhighway covering the countries of Asia and the Pacific Rim.

The Escalating Demand for Orbital Slots

In recent years, many Asian nations have elected to modernize their telecommunications networks. Consequently, there has been a dramatic escalation in demand for these coveted orbital assignments. Even sparsely-populated countries, such as the Kingdom of Tonga and Papua New Guinea—which have very small domestic needs for satellite capacity—have joined the fray, seeing satellite orbital positions as a resource that, in conjunction with foreign partners, can be used to generate income.

Papua New Guinea's Pacstar satellite company has filed advance notice with the International Telecommunication Union (ITU)—the United Nations body that regulates international telecommunications—for registration of the orbital positions of 167.45 and 185 degrees East Longitude. The Kingdom of Tonga, a Pacific island, also has registered a multiplicity of orbital slots—far more than this country could possibly need to serve its domestic needs.

The ITU currently allows countries to file for closely-located—or even identical—orbital positions and expects the countries involved to resolve any potential conflicts through a coordination process. In some cases, the collocation of satellites operated by different entities can be resolved through coordination, such as operating the two satellites via different frequency bands, or allowing for sufficient geographical separation between the two satellites' uplink and downlink beams. Whenever two collocated, or closely located, satellites operate via the same frequency spectrums with overlapping coverage beams, conflict inevitably arises.

Tonga already has transferred the use of four ITU-registered positions to Rimsat and Unicom—two privately-owned international satellite operators based in the United States. Moreover, negotiations are under way to transfer the use of additional orbital slots to other overseas customers.

This policy has brought Tonga into conflict with INTELSAT—the international satellite cooperative comprised of 128 member nations. Tonga claims that INTELSAT has infringed on two of its orbital positions—70 and 83.3 degrees East Longitude—by filing for nearby positions at 69 and 85 degrees East Longitude. (Satellites must be separated by at least two degrees in longitude or they will likely cause interference to each other's transmissions). Tonga further insists that INTELSAT has made the filings in order to prevent other satellite operators from launching competing systems.

The Agreements with Rimsat and Unicom

Tongasat was founded by Dr. Matt Nilson in early 1988, after having been personally granted an exclusive 50-year franchise by His Majesty The King to register orbital positions on behalf of the Government of the Kingdom of Tonga, and to arrange for entities to launch and/or operate satellites in orbital positions registered to Tonga. Tongasat is owned by three shareholders, with the majority held by its Chairperson, HRH Princess Salote Pilolevu, the only daughter of His Majesty The King.

In 1991, Tongasat negotiated an Agreement with Unicom Satellite Corporation of Aspen, Colorado, for the use of two orbital positions (138 and 170.75 degrees East Longitude), an option for the use of a third position (70 degrees East Longitude), with rights of first refusal under certain conditions for additional positions not yet committed to others.

In April of 1992, Tongasat enlisted the assistance of Rimsat Ltd., a U.S. firm based in Fort Wayne, Indiana, to procure and lease Russian satellites for launch into the remaining Tongan orbital positions of 134, 142.5, and 130 degrees East Longitude.

According to Tongasat, the Tongan relationships with Rimsat and Unicom connote mutually desirable partnerships or joint ventures, rather than just legal agreements for the use of the orbital positions. Tongasat refers to these relationships as essential partnerships in which neither side can perform the communications services planned without the other's assistance.

INTELSAT and others refer to Tongasat's activities as "warehousing" and "trading" in orbital positions for pecuniary gain, activities in contravention of International Telecommunication Union (ITU) agreements. These agreements seek to assure that each member administration will have the ability to meet its national requirements for satellite service through fair and equitable access to the geostationary arc. In September of 1993, these objections were supported by U.S.-based international satellite operators Columbia Communications Corporation and PanAmSat, U.S. satellite operators which filed objections with the U.S. Federal Communications Commission. Included in their motions were recommendations for the U.S. Government to deny U.S. landing rights to Tonga customer Rimsat Ltd., of Fort Wayne, Indiana.

A denial of landing rights would prevent U.S.-based teleports from transmitting or receiving signals from the Rimsat satellite currently collocated at 134 degrees East Longitude with Indonesia's Palapa Pacific satellite. Many others, however, see Tonga's transferral of orbital positions to private international satellite operators as not demonstrably different from actions taken by the U.S. Federal Communications Commission. For years, the FCC did the same on behalf of companies such as PanAmSat and Orion, two organizations with substantial overseas financial support. PanAmSat has responded by stating that there are fundamental differences between the ways in which the FCC and Tongasat assign orbital positions and frequencies.

"The FCC does not request orbital locations until it has applicants before it who have proposed satellite systems and are prepared to demonstrate to the FCC that they are technically and financially prepared to proceed with their proposals. With respect to domestic satellite applicants, the FCC enforces a strict period in which the applicant must commence construction of its system. With respect to applicants for international systems, the FCC recognizes the increased difficulties in completing the multi-lateral negotiations that are required to obtain foreign *landing rights* for such systems and

Orbit	Inclin.†	Satellite	Operator	Date	Bands	Pol.
52.8 E	±0.64°	Stat. 5/Gorizont 27	Russia	1993	C3/K5	RH
53 E	—	Express 5	Russia	1994	C/K	CP
57 E	±2.98°	INTELSAT 507	INTELSAT	1983	C1/K3	CP/LP
57 E	—	INTELSAT 7	INTELSAT	1995	C/K	CP/LP
60 E	±0.03°	INTELSAT 604	INTELSAT	1990	C2/K	CP/LP
62 E	—	INTELSAT 6/7/8	INTELSAT	?	C/K	CP/LP
63 E	±0.03°	INTELSAT 602	INTELSAT	1981	C2/K	CP/LP
64 E	—	INTELSAT 6/7/8	INTELSAT	?	C/K	CP/LP
66 E	±3.64°	INTELSAT 505	INTELSAT	1982	C1/K3	CP/LP
66 E	—	INTELSAT 7	INTELSAT	1995	C/K	CP/LP
68 E	—	PAS-6	PanAmSat [U.S.]	1995	C/K	LP
69 E	—	INTELSAT	INTELSAT	?	C/K	CP/LP
70 E	±1.82°	Stat. 20/Raduga 25	Russia	1990	C4	RH
70 E	—	Tongasat/Unicom F2	Unicom [U.S.]	1997	C1/K	LP
70 E	—	Stationsar	Russia	?	C/K	CP
72 E	—	PAS-7	PanAmSat [U.S.]	1995	C1/K	LP
73.5	—	Turksat	Turkey	?	K	LP
73.6 E	±0.03°	Insat II-A	ISRO [India]	1992	C1/S	LP
77 E	—	Apstar 2	Apstar [H. Kong]	?	C/K	LP
78.5 E	—	Thaicom A1/A2	SCC [Thailand]	93/94	C1/K	LP
80.1 E	±0.37°	Stat. 13/Gorizont 24	Russia	1991	C3/K5	RH
80.0 E	—	Express 6	Russia	1994	C/K	CP
83.1 E	±0.36°	Insat 1-D	ISRO [India]	1990	C1/S	LP
83.3 E	—	Tongasat	Tongasat [Tonga]	?		
84.4 E	±1.37°	Stat. 3/Raduga 30	Russia	1993	C4	RH
87.5 E	±0.53°	Chinasat 1	PRC	1988	C1	LP
89 E	—	INTELSAT	INTELSAT	?	C/K	CP/LP
90.3 E	±1.40°	Stat. 6/Gorizont 28	Russia	1993	C3/K5	RH
90 E	—	Express	Russia	1994	C/K	CP
91.5 E	±5.08°	INTELSAT 501	INTELSAT	1981	C1/K3	CP/LP
91.75 E	—	Koupon	Russia	1995	C/K	CP/LP
93.5 E	±0.08°	Insat II-B	ISRO [India]	1993	C1/S	LP
95 E	—	CSDRN	Russia	?	K	CP
95 E	—	Measat	Malaysia	?	C/K	?
95 E	—	INTELSAT	INTELSAT	?	C/K	CP/LP
96.5 E	—	Express 8	Russia	1994	C/K	CP
96.9 E	±2.23	Stat. 14/Gorizont 19	Russia	1989	C3/K5	RH
98.15 E	±0.09	Chinasat	PRC	1990	C	LP
99.0 E	—	Express 13	Russia	1996	C/K	CP
100.5 E	—	Asiasat 2	Asiasat [H. Kong]	1995	C/K	LP
101.5 E	—	Chinasat 11	PRC	?	C	LP
103 E	—	Express	Russia	1994	C/K	CP
103 E	—	DFH-3	PRC	?	C	LP
102.7 E	±0.18°	Stat. 21/Gorizont 25	Russia	1986	C3	RH
103.0 E	—	Express 9	Russia	1995	C/K	CP
105.5 E	±0.04°	Asiasat 1	Asiasat [H. Kong]	1989	C1	LP
105.5 E	—	Chinasat 12	PRC	1994	KK	LP
107.7 E	±0.05°	Palapa B2R	Indonesia	1990	C1	LP
108 E	—	Palapa C1	Indonesia	1995	C/K	LP

† Orbital inclination as of December 2, 1993.

Orbit	Inclin.†	Satellite	Operator	Date	Bands	Pol.
109.9 E	±0.02°	BS-3A, BS-3B	Japan	90/91	K	CP
110 E	—	NSAT	Japan	1995	C/K	LP
110 E	—	BS-4A, BS-4B	Japan	1997	K	CP
110.7 E	±0.05°	Chinasat 2	PRC	1988	C1	LP
112.9 E	±0.01°	Palapa B2P	Indonesia	1987	C1	LP
113 E	—	Palapa C2	Indonesia	1995	C/K	LP
113 E	—	Koreasat	South Korea	1995	K	CP/LP
115.5 E	±0.05°	Chinasat 5	PRC	1984	C1/K1	LP
115.5 E	—	DFH-3 D	PRC	?	C1/K1	LP
116 E	—	Koreasat	South Korea	1995	K	CP/LP
116 E	—	Asiasat	Asiasat [H. Kong]	?	C/K	LP
118.1 E	±0.01°	Palapa B4	Indonesia	1992	C1	LP
120 E	—	Thaicom3	SCC [Thailand]	1995	C/K	LP
120 E	—	JCSAT	JSCS [Japan]	1995	K2	LP
121 E	—	DFH-3 E	PRC	1995	C	LP
122 E	—	Asiasat	Asiasat [H. Kong]	?	C/K	LP
124 E	—	JCSAT	JSCS [Japan]	?	K2	LP
125 E	—	DFH-3 A	PRC	1995	C	LP
128 E	—	JCSAT	JSCS [Japan]	?	K2	LP
128 E	—	N-STAR A/B	NTT [Japan]	1995	C/Ka	CP
128.5 E	±1.06°	Raduga 27	Russia	1991	C3	RH
130 E	±1.44°	Gorizont 29/Tongasat	Rimsat [U.S.]	1994	C/K	CP
130 E	—	Chinasat 4	PRC	?	C	LP
131 E	—	Apstar 1	Apstar [H. Kong]	1994	C	LP
131.8 E	±0.04°	CS-3A	NTT [Japan]	1988	C1/Ka	CP
132 E	—	N-STAR B	NTT [Japan]	1995	C/Ka	CP
133.9 E	±3.14°	Palapa Pacific-1	Indonesia	1983	C1	LP
134.3 E	±2.82°	Gorizont 17	Rimsat [U.S.]	1983	C3/K5	CP
134 E	—	Apstar	Apstar [H. Kong]	1995	C	LP
135.8 E	±0.04°	CS-3B	NTT [Japan]	1988	C1/Ka	CP
136 E	—	N-STAR B	NTT [Japan]	1995	C1/Ka	CP
138 E	—	Tongasat	Unicom [U.S.]	1996	C/K	LP
139 E	—	Palapa Pacific-2	Indonesia	1994	C	LP
140 E	—	Express	Russia	1994	C/K	CP
139.3 E	±2.36°	Stat. 7/Gorizont 18	Russia	1989	C3/K5	RH
140.0 E	—	Express10	Russia	1996	C/K	CP
142 E	—	Thaicom 4	SCC [Thailand]	?	C/K	LP
142.5 E	—	Tongasat	Rimsat [U.S.]	?	C/K	CP
144.0 E	—	Palapa Pacific-3	Indonesia	1995	C	LP
145 E	—	Stat. 16/Express 11	SOVCAN Star	1995	C/K	CP
146 E	—	JCSAT	JSCS [Japan]	1996	?	?
148 E	—	Measat	Malaysia	?	C/K	LP
150 E	±0.02°	JCSAT 1	JSCS [Japan]	1989	K2	LP
153.9 E	±0.01°	JCSAT 2	JSCS [Japan]	1990	K2	LP
156 E	±0.06°	Optus A3	Optus [Australia]	1987	K2	LP
157 E	—	INTELSAT 5/7/8	INTELSAT	?	C/K	CP/LP
158 E	±0.05°	Superbird A	SCC [Japan]	1992	K2/Ka	LP
160 E	±0.04°	Optus B1	Australia	1992	K2	LP
162 E	±0.03°	Superbird B	SCC [Japan]	1992	K2/Ka	LP
164 E	±0.55	Optus A2	Australia	1985	K2	LP

† Orbital inclination as of December 2, 1993.

Orbit	Inclin.†	Satellite	Operator	Date	Bands	Pol.
166 E	—	PAS-5	PanAmSat [U.S.]	1995	C/K	LP
167.5 E	—	Pacstar F1	Papua N. Guinea	1995	C1/K2	LP
168 E	—	PAS-4	PanAmSat [U.S.]	1995	C/K	LP
170 E	—	Unicom F1	Unicom [U.S.]	1996	C1/K	LP
170.8 E	—	Tongasat	Unicom [U.S.]	1996	C1/K	LP
172 E	—	PacifiCom-1	TRW [U.S.]	1995	C1/K	LP
174 E	±0.03	INTELSAT 701	INTELSAT	1994	C/K	CP/LP
177 E	±0.80°	INTELSAT 511	INTELSAT	1985	C1/K3	CP/LP
177 E	—	INTELSAT 703	INTELSAT	1994	C/K	CP/LP
180 E	±2.30°	INTELSAT 508	INTELSAT	1984	C1/K3	CP/LP
178 E	—	Finansat	U.S.	?	C/K	LP
177 W	±4.16°	INTELSAT 503	INTELSAT	1981	C1/K3	CP/LP
175 W	—	Pacstar 2	Papua N. Guinea	1995	C1/K2	LP
174.4 W	±0.01	TDRS-5	NASA/Columbia	1991	C1/K	LP
171 W	±4.01°	Stat. 10/Raduga 21	Russia	1987	C3	RH

† Orbital inclination as of December 2, 1993.

allows the applicants additional time to commence construction. In each instance, however, the FCC polices its applicants to prevent abuses of the ITU's process. Tonga, through a delegation of authority to its satellite promoters, on the other hand, filed with the ITU without any idea of what it would do with the orbital locations covered by its filing, and with no intent of building or launching a system."

In responding to the charges filed by Columbia and PanAmSat, Rimsat Ltd., put forth the following argument:

"For the past eight years, United States policy has been to promote the development of competitive alternatives to INTELSAT....Six years ago, the Kingdom of Tonga developed a proposal to establish a regional satellite system....After some study, the Kingdom decided to establish Tongasat to prepare the appropriate applications for submission to the ITU and to license a consortium of Administrations to place satellites in orbit to serve the Asia-Pacific area; however, formation of the consortium did not take place. The countries that might have participated could not mass the enormous capital required to construct, to launch and to operate a system of satellites and its associated earth stations. After further consideration, Tonga recognized that adequate Asia-Pacific satellite service would arrive in the near-term only through the infusion of substantial outside capital. Accordingly, and to assist the process, Tonga decided to license private system operators to place satellites in Tongan orbital positions, just as the U.S. and the other developed countries have done for the past thirty years."

Malaysia Disputes Claims of INTELSAT

Although Malaysia and Thailand have made more modest claims for positions along the geostationary arc, they too have been drawn into this battle of the skies. In 1992, Malaysia Telekom registered two orbital slots for

a domestic satellite system to begin serving Malaysia later in the decade. However, INTELSAT has its own plans to use one of the orbital slots (95 degrees East Longitude) previously claimed by Malaysia for a regional "land mass" satellite for Asia. INTELSAT's rationale? Its analysts believe it is unlikely that Malaysia would actually use this orbital assignment at any time in the near future.

Held in May of 1993 at Singapore's World Trade Center, *Asia Telecom '93* served in part as a forum for discussions concerning future use of the geostationary arc. During a talk by INTELSAT Director General Irving Goldstein, irate representatives of Malaysia Telekom questioned INTELSAT's right to usurp an orbital position previously registered by their country. INTELSAT subsequently announced that it would vacate the Malaysian orbital position prior to the launch of Malaysia's first telecommunications satellite.

Thailand and Asiasat Settle Orbital Dispute

Until recently, Hong Kong-based Asiasat—the region's premiere satellite operator—also was engaged in a dispute with Thailand's domestic satellite owner over another orbital assignment. Shinawatra Satellite, the recipient of Thailand's Thaicom domestic satellite franchise, originally intends to launch its first communications spacecraft in December, 1993, to 101.5 degrees East Longitude, a location that was too close to the orbital assignment for Asiasat 2, scheduled for launch in 1995. Discussions between Asiasat and SCC, however, resulted in a compromise in which Asiasat agreed to forego the use of the orbital position of 77 degrees East Longitude—one of its ITU-registered positions—in exchange for Shinawatra relinquishing its claim on the 101.5 degrees East Longitude slot. Under the compromise announced in September of 1993, Shinawatra will collocate both of its satellites at 78.5 degrees East Longitude, allowing Asiasat to position its second satellite at 100.5 degrees East Longitude beginning in 1995.

Papua New Guinea Versus PanAmSat

Papua New Guinea has filed, on behalf of Pacstar, for use of the orbital position of 167.45 degrees East Longitude. Meanwhile, PanAmSat has issued its own filings for the orbital positions of 166 and 168 degrees East Longitude. Due to the technical incompatibility of the two dual-band satellite systems, it was impossible to coordinate the use of both systems at the above-mentioned orbital positions.

In September of 1993, PanAmSat notified the U.S. Federal Communications Commission (FCC) that Papua New Guinea's Pacstar satellite venture was attempting to obtain payments and transponder capacity on PAS-2 from PanAmSat in exchange for an amenable resolution to the orbital dispute between the two organizations. Pacstar denied PanAmSat's claims and maintained that any dispute between the two organizations must be

resolved by the International Telecommunication Union, which has international jurisdiction, rather than the U.S. Federal Communications Commission, which is a national telecommunications regulatory organization.

Fighting It Out in the Trenches

While satellites traditionally transmit video, voice, and data services, it is the satellite TV transmissions that usually capture the attention of the public at large. Satellite TV is fast becoming a major force in Asia. Millions of homes in Korea, Taiwan, Japan, India, Indonesia, Thailand, and even the People's Republic of China already have home satellite dishes.

Until fairly recently, many experts were predicting that China eventually would become the world's largest market for satellite and cable TV services. The Chinese Government, however, has since announced a ban on the private, unlicensed ownership of satellite TV systems, even though TVRO sales in China during 1992 were said to exceed 500,000 units. Current dish owners have been ordered to either dismantle their systems or face substantial penalties. Just how enforceable the ban will be in a country as large and diverse as China remains to be seen.

While other countries such as Singapore and Malaysia also do not permit the sale of home satellite TV systems, the pressure is on to give citizens direct access to a proliferation of programming resources from around the world. Most industry analysts believe that it is only a matter of time before these markets open up, just as they have in most other areas of the world.

Countries such as Indonesia have realized that the future of TV in the region will be based on satellite rather than cable or over-the-air delivery. Cable TV systems—even those with a very limited channel capacity—often take years to establish and never can reach most rural populations. Satellite TV signals, however, are available right now through the installation of relatively small and inexpensive receiving systems.

In traditional warfare, the opposing camps usually attempt to strike powerful alliances to solidify their positions and intimidate their opponents. At the time of writing, Hong Kong's STAR TV was considered to be the region's premiere programming powerhouse. However, a competing group of international TV programmers recently formed an "alliance" that will offer a formidable programming package via future satellite systems which they perceive to be more desirable.

Alliance members Australia Television International, CNN International, ESPN International, TVB International, Discover Communications, Viacom Networks and Time Warner have agreed to lease about a dozen transponders on Apstar 1 and sixteen transponders on Apstar 2 following their successful launches in 1994 and 1995. All of these services currently have berths on Indonesia's Palapa B2P satellite.

The move to Apstar 1 and Apstar 2 will give the new Alliance wider distribution in the region via more powerful satellites, and will also allow the group to market their programming package to Asian home satellite dishes

by means of common encryption, sales, and marketing strategies.

A second consortium headed by Australian business tycoon Kerry Packer also lies waiting in the wings. Australian programmers recently have become concerned about STAR TV becoming a dominating force in their country. STAR TV will move to channels on the new Asiasat 2 satellite in 1995. This new satellite will have a transmit beam that covers all of the Australian continent.

STAR TV—operator of the five-channel, free-to-air package of programming services that includes MTV Asia, BBC World Service Television, and a sports service produced by America's Prime Sports Network—currently has an exclusive franchise to offer regional TV services via Asiasat 1. STAR TV also has reserved eight transponders on the upcoming Asiasat 2 satellite due to be launched in early 1995. This agreement will allow STAR TV to maintain its role as the system's exclusive regional TV provider through the end of the century.

The first major battleground between STAR TV and the new Alliance will be Indonesia, where the government currently is formulating a policy for the introduction of pay TV—including direct-to-home satellite TV reception of encrypted services. There currently are more than 500,000 home satellite TV systems in Indonesia. A further 10,000 systems are being sold each month.

From Conflict to Cooperation

A move from conflict to cooperation is essential if the nations of Asia are to achieve their long-term goal of quickly developing domestic and regional telecommunications infrastructures. It is certainly in the general interest of international satellite operators and programmers that this matter be resolved so that their plans can unfold in a predictable manner. The question is how to achieve the required cooperation.

The United Nations has taken a more active role in recent years to police potential trouble spots around the globe from Kuwait and Somalia to the war-ravaged republics of former Yugoslavia. It is now time for the telecommunications body of the United Nations—the ITU—to take a more active role in guaranteeing that orbital slots be assigned in a fair and equitable manner. This may require the introduction of new regulations at the next World Administrative Radio Conference (WARC).

Changes in the ITU filing rules which may be deemed appropriate include: limitations on the number of positions for which a particular satellite system may request; a limit in the number of years allowed between the filing for a position and the actual launch of the spacecraft; and, a demonstration of progress toward manufacture and launch similar to the U.S. Federal Communication Commission's "due diligence" requirement.

New satellite operators should be limited to a period of five years between filing for an orbital position and actually launching their satellite. This is an eternity in today's fast-paced telecommunications marketplace. Some provision for extension of this period could be provided under special circum-

stances, such as unforeseen delays on the part of a satellite manufacturer or a launch vehicle provider.

Countries such as the U.S. (on behalf of PanAmSat), the U.K. (on behalf of Hong Kong), and the Kingdom of Tonga previously have filed for many more orbital positions than their most optimistic short-term projected plans require. In some cases, these multiple filings have been undertaken to ensure that one or more positions actually are obtained in light of the confusion surrounding the current ITU filing process. The result of this strategy is that many orbital positions which actually never will be used by the filing countries are tied up needlessly. Individual regional or national systems should be limited to two "prime" orbital positions for an initial filing. The ITU could establish a reserve of "secondary" orbital positions scattered throughout the geostationary orbital arc which would be awarded on a *first-come, first-served basis* to countries with systems under development if actual, concrete progress has been made towards launching their primary satellite or satellites into orbit.

Satellite systems which exist purely on paper and have not moved forward within an established length of time should automatically be removed from consideration. The U.S. Finansat and Papua New Guinea's Pacstar systems, for example, have been in the planning stages for nearly ten years without the actual construction of a single satellite.

All too often, economic disputes are a fundamental cause of conflict between nations. Satellites represent an indispensable resource that is essential to long-term economic development. Cooperation, not conflict, is needed to ensure that 3.3 billion people in the Asia/Pacific region have access to the knowledge and economic power that only satellites can provide.

Chapter Three:

INTELSAT Satellites in the Asia/Pacific Region

On August 20, 1964, eleven countries signed a charter creating the International Telecommunications Satellite Organization (INTELSAT)—the first worldwide satellite communications network. INTELSAT began offering transatlantic telecommunications services in 1965 after the successful deployment of INTELSAT I (Early Bird), the world's first commercial geostationary satellite. Today, fifth and sixth generation INTELSAT satellites provide international and domestic communications services on behalf of 130 member nations.

The Structure of INTELSAT

Since 1973, INTELSAT has operated with an organizational structure that has four tiers: the Assembly of Parties, the Meeting of Signatories, the Board of Governors, and the Executive Organ.

The *Assembly of Parties*, composed of representatives from INTELSAT member countries, formulates the organization's long-term objectives. The *Meeting of Signatories*, also composed of governmental representatives, establishes financial, technical, and operational standards. The *Board of Governors* makes decisions about the design, development, construction, operation, and maintenance of INTELSAT satellites. The *Executive Organ*, headed by the INTELSAT Director General, is responsible for the day-to-day management and operation of INTELSAT.

The INTELSAT space segment is composed of eighteen satellites in geosynchronous orbits centered over the Atlantic, Pacific, and Indian Oceans for transoceanic telecommunications traffic, and one satellite in geosynchronous orbit over the landmass of Southeast Asia. Over 180 countries, territories, and dependencies now access the INTELSAT system through more than 2,700 earth station-to-earth station links for international telephone, television, facsimile, and data communications.

As of March, 1993, the INTELSAT system carried more than 130,000 public-switched service channels and more than 240 full-time leases. Applications include international, regional, and domestic telephony; TV and radio broadcasting; private business networks; submarine fiberoptic and analog cable restoration; and capacity for United Nations peacekeeping operations. More than ever before, INTELSAT's services now are digital, including digital public-switched traffic and compressed digital video.

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INTELSAT V Satellites

INTELSAT V series satellites have long been the workhorses of the Asia/Pacific Region. Beginning in 1994, the INTELSAT V satellites over the Indian and Pacific Oceans will be replaced by newer INTELSAT V-A and INTELSAT VII satellites.

INTELSAT V-A Satellites

INTELSAT V-A F10, F11, and F12 (510, 511, and 512) are enhanced versions of the three-axis stabilized INTELSAT V design with extra zone beam transponders and a second set of cross-polarized global beam transponders. The INTELSAT V-A antenna payload offers several beam

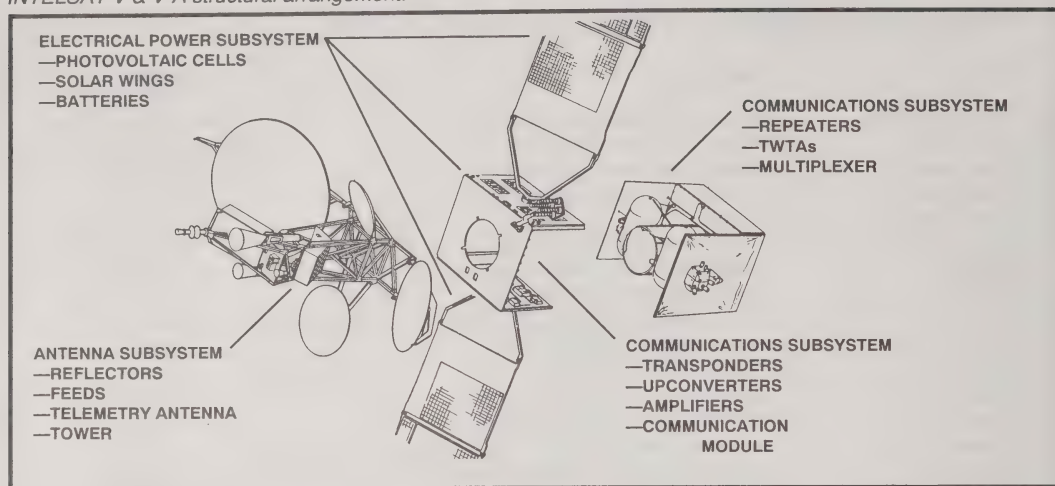
INTELSAT SIGNATORIES IN THE ASIA/PACIFIC REGION

Country	Signatory	Share
Afghanistan	Ministry of Communications	0.050000
Armenia	Ministry of Communications	0.050000
Australia	Telstra Communications Ltd.	2.590409
Azerbaijan	Ministry of Communications	0.050000
Bahrain	BATELCO	0.050000
Bangladesh	Telegraph & Telephone Board	0.225870
Bhutan	Department of Communications	0.050000
China	Ministry of Post & Telecom.	1.787019
Fiji	Fiji International Telecom. Ltd.	0.050000
India	Videsh Sanchar Nigam Ltd.	2.070837
Indonesia	PT INDOSAT	0.600000
Iran	Government of Republic of Iran	0.883984
Iraq	Government of Republic of Iraq	0.246232
Israel	BEZEQ: The Israel Telecom. Corp., Ltd.	0.490702
Japan	Kokusai Denshin Denwa (KDD) Co., Ltd.	4.493748
Korea (South)	Korea Telecom	1.419335
Kuwait	Ministry of Communications	0.845049
Lebanon	Government of Lebanon	0.050000
Malaysia	Syarikat Telecom Malaysia Berhad	0.648763
Micronesia	Telecommunications Corporation	0.050000
Nepal	Nepal Telecommunications Corp.	0.067002
New Zealand	Telecom Corporation of New Zealand, Ltd.	0.660033
Oman	Sultanate of Oman	0.207807
Pakistan	Government of the Islamic Republic of Pakistan	1.000000
Papua New Guinea	Post and Telecommunication Board of P. N. G.	0.050000
Philippines	Philippine Comm. Satellite Corp. (Philicomsat)	0.639941
Qatar	Qatar Public Telecom. Corp. (Q-TEL)	0.266322
Russian Federation	Ministry of Communications	0.055641
Saudi Arabia	Government of Saudi Arabia	1.649475
Singapore	Singapore Telecom. (Private) Ltd.	1.960000
Sri Lanka	Government of Sri Lanka	0.075000
Thailand	Government of Thailand	1.175881
Turkey	Government of Turkey	0.500000
United Arab Emirates	Ministry of Communications	1.166349
Viet Nam	Direction Générale des Postes et Télécommunications	0.050000
Yemen	Government of the Republic of Yemen	0.186703

coverage patterns that have been designed to meet specific traffic requirements. On C-band, each INTELSAT V-A satellite carries global, hemispheric, zone, and spot beams. The global beams can relay signals to any point within the 42 percent of the Earth's surface that is visible from the satellite's assigned location in orbit. INTELSAT V-A global beams generate a maximum beam-edge EIRP of 23.5 dBW. In addition, some of the C-band transponders can be switched to high-gain antennas, providing two spot beams with a nominal EIRP of 32.5 dBW.

East and West hemispheric beams can relay signals to the Eastern or

INTELSAT V & V-A structural arrangement.



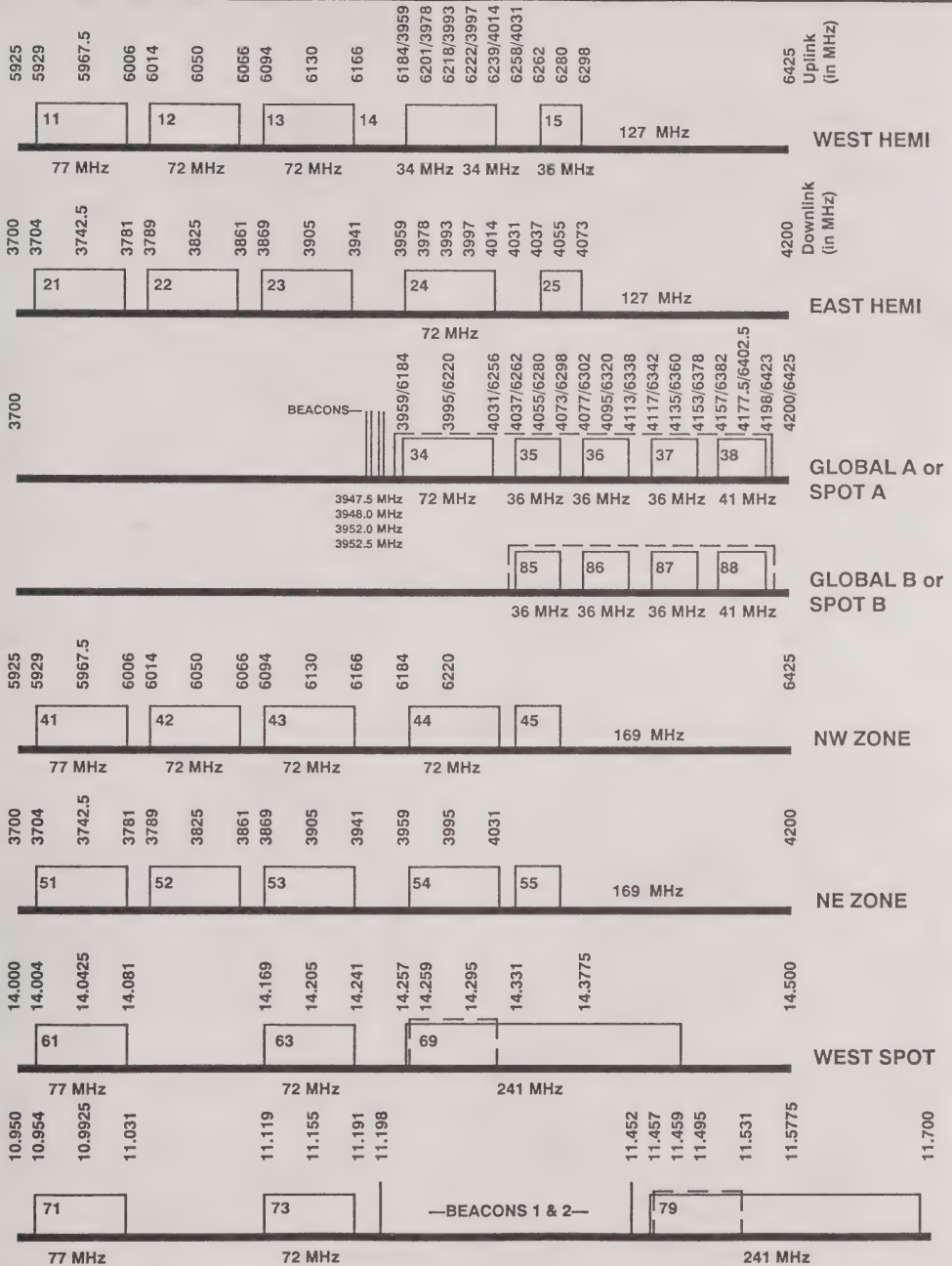
Western Hemispheres of the Earth relative to the satellite's position in orbit. INTELSAT V-A hemispheric beams generate a nominal EIRP of 29 dBW. The C-band frequency range effectively is used twice through the spatial isolation between the two beams.

Two zone beams can relay signals to locations to the Northeast and to the Northwest of the satellite's orbital position. Zone beams generate a nominal EIRP of 29 dBW. The zone and hemispheric beams are cross-polarized so that the satellite can transmit East and West zone beams simultaneously; i.e., the C-band frequency range effectively is used twice through the spatial isolation of the East and West zone beams.

On Ku-band, steerable East and West spot beams relay medium-powered signals to designated areas on the Earth's surface. These beams can generate nominal EIRPs of 41 and 44 dBW, respectively, and are cross-polarized so both can transmit into the same region simultaneously.

INTELSAT V-A satellites carry cross-strapped C- and Ku-band transponders so that signals can be uplinked using one frequency band and then downlinked using the other. Signal routing is controlled by a command signal that energizes the satellite's switching matrix.

INTELSAT Satellite:	V & VA	VI	VII	VII-A	VIII
HEMI	29 dBW	31 dBW	33 dBW	33 dBW	34.5/36 dBW
ZONE	29 dBW	31 dBW	33 dBW	33 dBW	34.5/36 dBW
GLOBAL	23.5 dBW	26.5 dBW	26/29 dBW	29 dBW	29 dBW
C-SPOT	32/35 dBW	Not Available	33/36 dBW	36 dBW	n/a
K-SPOT	41.5 dBW	45 dBW	46 dBW	47 dBW	44/47 dBW
	(Nominal)	(Nominal)	(Nominal)	(Nominal)	(Nominal)



INTELSAT V-A transponder layout.

INTELSAT V Global, Hemi, & Zone Beam Coverage from 174 Degrees East Longitude



INTELSAT V Global, Hemi, & Zone Beam Coverage from 66 Degrees East Longitude



Peak Global EIRP:	27.5 dBW
1st contour:	26.5 dBW
2nd contour:	25.5 dBW
3rd contour:	24.5 dBW
4th contour:	23.5 dBW

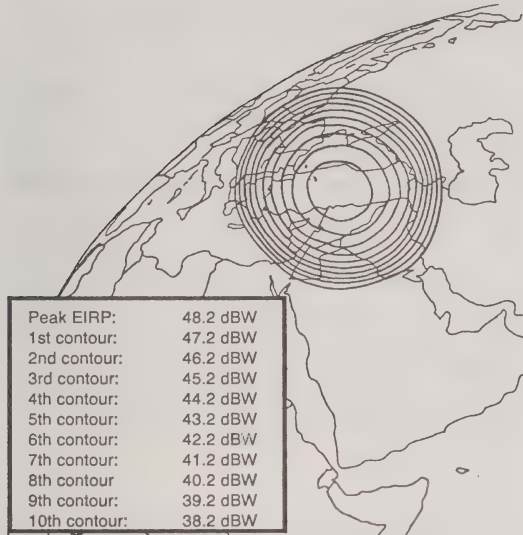
Edge Hemi EIRP:	29 dBW
Edge Zone EIRP:	29 dBW



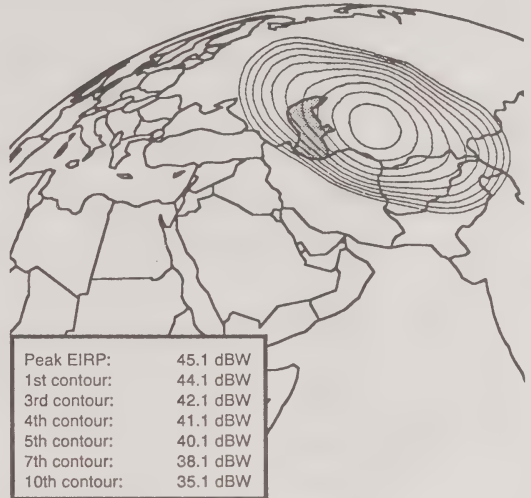
INTELSAT V C-band Global, Hemispheric and Zone Beams from 91.5 degrees East Longitude.

INTELSAT V Global, Hemi & Zone Beam Coverage from 57 degrees East Longitude

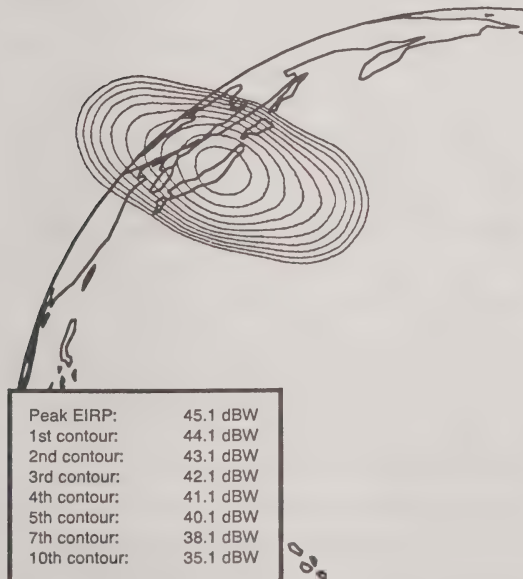
INTELSAT V West Spot Beam Coverage from 57 degrees East Longitude



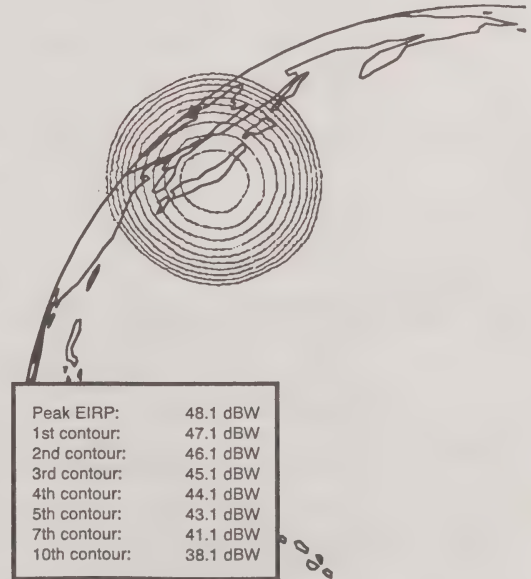
INTELSAT V East Spot Beam Coverage from 57 degrees East Longitude.



INTELSAT V East Spot Beam Coverage of Japan (POR).



INTELSAT V West Spot Beam Coverage of Japan (POR).



INTELSAT V-A Satellites and the Comsat Maneuver

INTELSAT V-A satellites which no longer have sufficient fuel reserves for normal geostationary operations may have their operational lifetimes extended through the cessation of North/South stationkeeping. These older satellites inhabit inclined orbits centered over 57, 66, 91.5, 177, and 183 degrees East Longitude. Use of the Comsat Maneuver, which consists of subtle but precise changes in the physical orientation of the satellite, ensures that the antenna pattern always remains centered over the desired coverage area. The satellite's North and South movements still occur, but ground antennas now can maintain constant contact by tracking the movement of the satellite. Motorized systems are used to alter the declination or elevation of all associated earth station antennas in the system.

INTELSAT V-A satellites using the Comsat Maneuver can accommodate international video leases, domestic leases, INTELSAT Business Services, Intelnet services, and Digital Television services. Performance, however, may vary because of several factors, including fuel availability, solar array power, and battery performance. Moreover, the Director General reserves the right to use capacity on inclined-orbit satellites for contingency restoration in the event of a failure involving any other INTELSAT satellite.

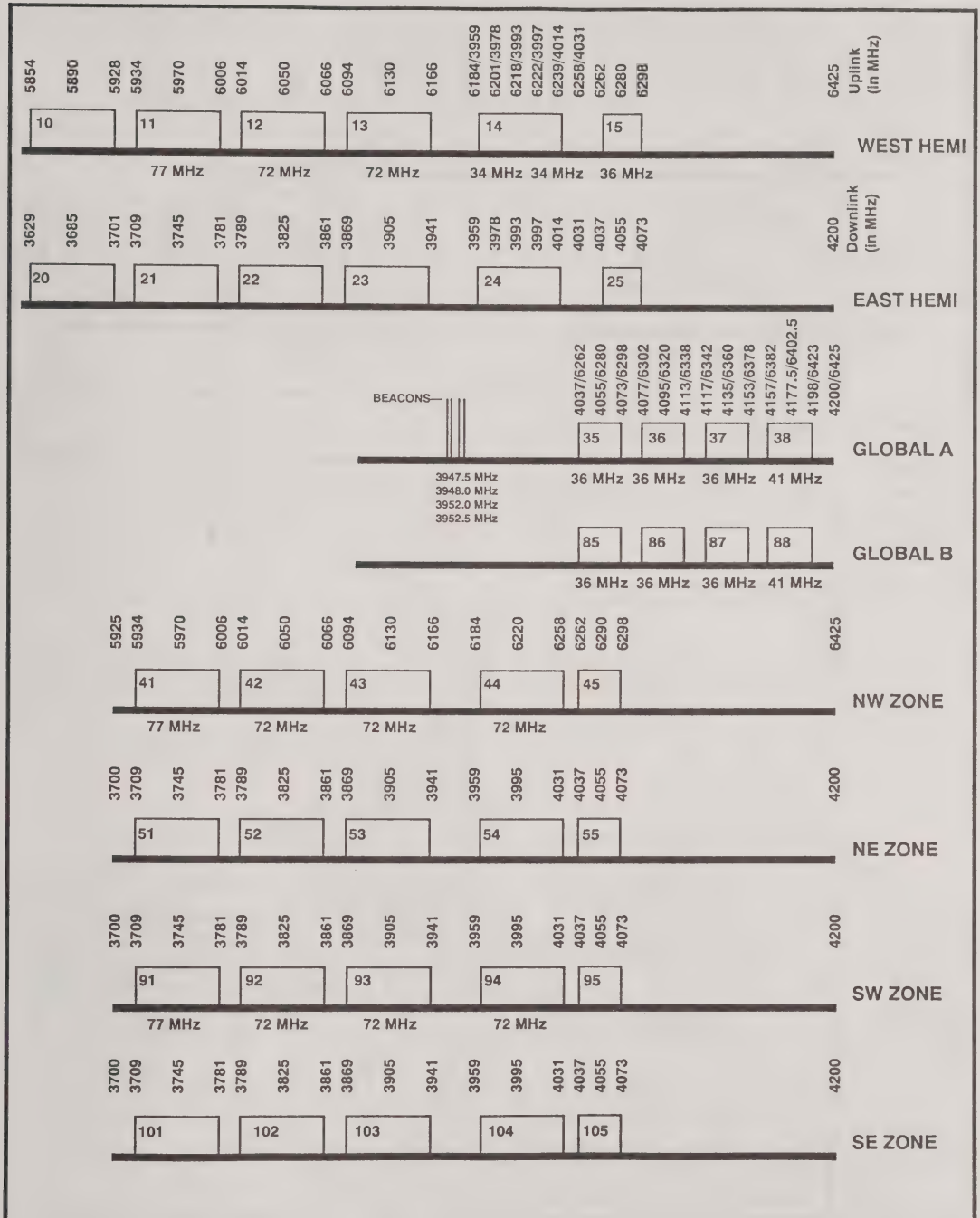
INTELSAT VI

INTELSAT VI satellites have the greatest mass and complexity of any commercial communications spacecraft in orbit. INTELSAT VI satellites are the first commercial telecommunications satellites to provide Satellite Switched Time Division Multiple Access (SS/TDMA), a technology that enables flexible interconnection of beams according to specific traffic requirements. INTELSAT VI can use advanced digital circuit multiplication equipment (DCME) to handle up to 120,000 telephone calls and three color television channels.

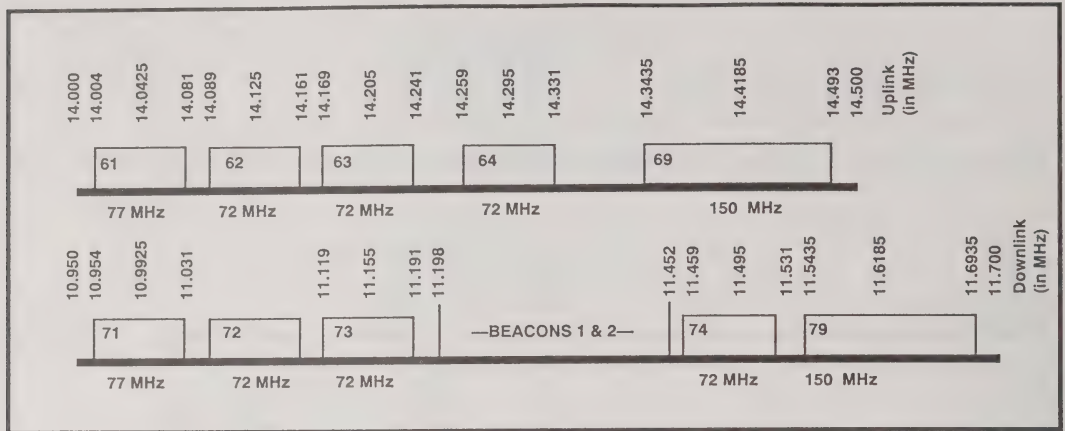
INTELSAT VI has been designed to handle high connectivity traffic loads at selected orbital locations in the Atlantic and Indian Ocean Regions. It is not anticipated that these spacecraft will come into use in the Pacific Ocean Region. The INTELSAT VI satellites located at 60 and 63 degrees East Longitude, however, do play a major role in serving customers in the Asia/Pacific Region.

INTELSAT VI Technical Description

Each INTELSAT VI satellite carries forty-eight transponders: thirty-eight operating in the C-band and ten in the Ku-band. Transponder connectivity is possible through advanced static switch matrixes. INTELSAT VI satellites have two and one-half times the capacity of INTELSAT V satellites. The increase was achieved by adding two more sets of zone beam (Southeast and Southwest) transponders and two additional hemispheric beam transponders which operate in the 3.6 to 3.7 GHz frequency spectrum assigned for Fixed Satellite Service by the 1979 World Administrative Radio Conference

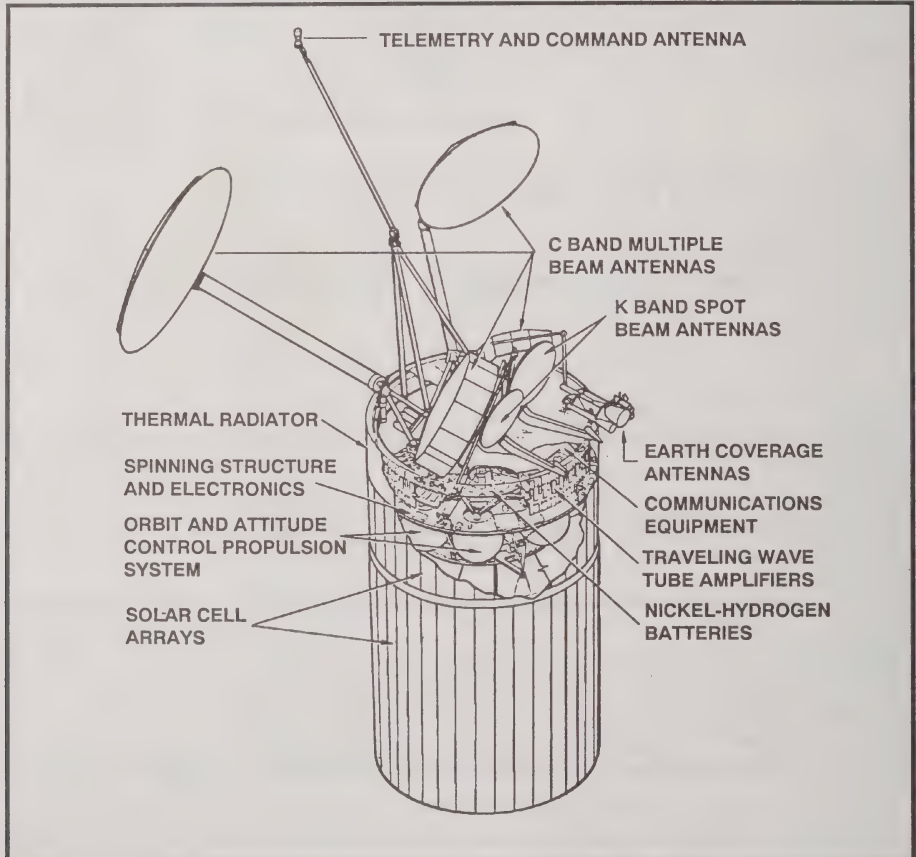


INTELSAT VI C-band transponder layout

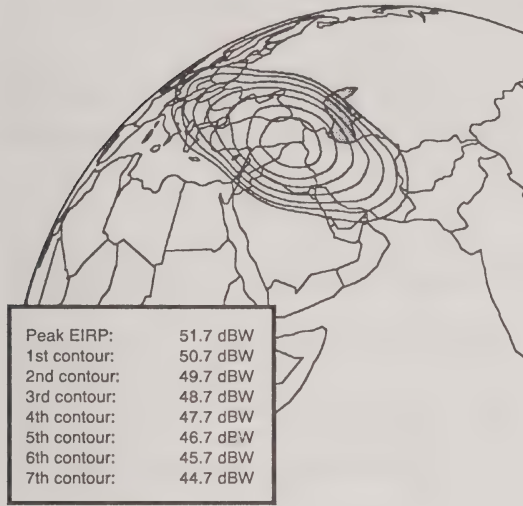


INTELSAT VI Ku-band transponder layout

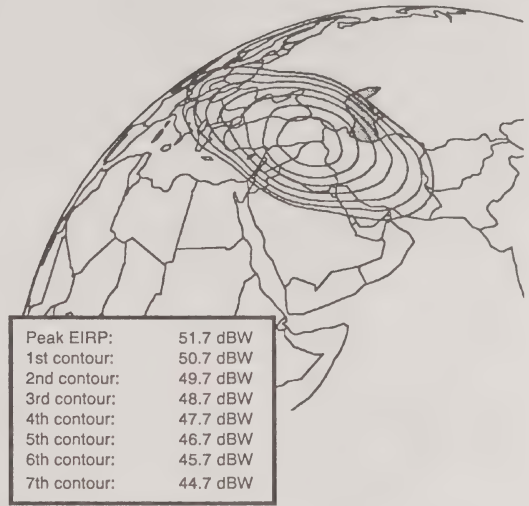
INTELSAT VI structural layout (Courtesy Hughes Aircraft Company.)



INTELSAT VI West Spot Beam
from 63 degrees East Longitude



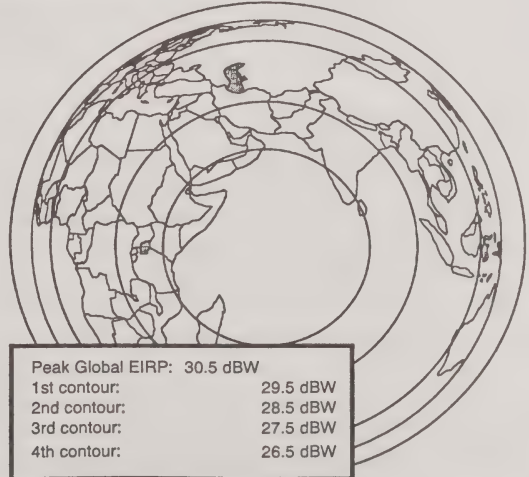
INTELSAT VI East Spot Beam
from 60 degrees East Longitude



INTELSAT VI Hemispheric Beams
from 60 degrees East Longitude



INTELSAT VI Global Beam
from 60 degrees East Longitude



(WARC). INTELSAT VI delivers a saturated beam-edge EIRP of 26.5 dBW from its global beams and 31 dBW from its hemispheric and zone beams.

INTELSAT VI satellites also carry additional Ku-band transponders. An increase in spot beam steerability covers all locations South as well as North of the Equator that are visible from the satellite's orbital position. Moreover, spot beam coverage has been expanded so that the size of the West spot beam equals that of the East spot.

INTELSAT VI satellites carry both 20 and 40 watt Ku-band TWTAs. The eight spot beam transponders connected to the 20 watt TWTAs deliver a nominal EIRP of 44.7 dBW, and the two spot beam transponders connected to the 40 watt TWTAs deliver a nominal EIRP of 47.7 dBW.

INTELSAT VII Satellites

INTELSAT VII satellites are expected to serve INTELSAT's needs well into the 21st century. The first of five INTELSAT VII satellites was launched in October of 1993.

INTELSAT VII satellites will provide follow-on service for the Pacific Ocean Region from 174 and 177 degrees East Longitude, replacing two INTELSAT V-A satellites that, by 1993, will be nearing the end of their normal geostationary lifetimes. Additional INTELSAT VII satellites will be positioned over the Atlantic and Indian Ocean Regions at orbital locations that do not require the highest level of connectivity.

INTELSAT VII Technical Description

The INTELSAT VII satellites carry a smaller payload than the INTELSAT VI series spacecraft in terms of the number of repeaters and total available bandwidth, and utilize a smaller and simpler C-band Hemi/Zone antenna. However, the satellites feature a spectacular array of capabilities including substantially higher EIRP levels, and the ability to choose—independently for each transponder—between the 11 GHz and the 12 GHz downlink frequency bands. These capabilities give INTELSAT greater flexibility than ever before in serving its customers around the world.

INTELSAT VII satellites use 10, 16, 20, and 30 watt SSPAs at C-band and 35 and 50 watt TWTAs at Ku-band. The higher power generated by the INTELSAT VII satellites allows INTELSAT customers to use smaller, less-expensive INTELSAT earth stations. INTELSAT VII's three independently-steerable Ku-band spot beams and single, steerable C-band spot beam also allows INTELSAT to offer a multitude of cost-effective domestic communications services.

The Communications Payload

The INTELSAT VII communications payload provides twenty-six C-band transponders (36, 41, 72, & 77 MHz bandwidths available) with thirty possible uplink channels (split transponder operations allow two 34 MHz sub-channels with transponders 5 and 6 to be received separately by the

satellite and then downlinked together). The satellite has two hemispheric beams, and four switchable zone beams (Zone 1 beams: alpha and delta; Zone 2 beams: beta and gamma). The global/C-spot transponders can be switched between global and steerable spot beams on a per-transponder basis by ground command. ←

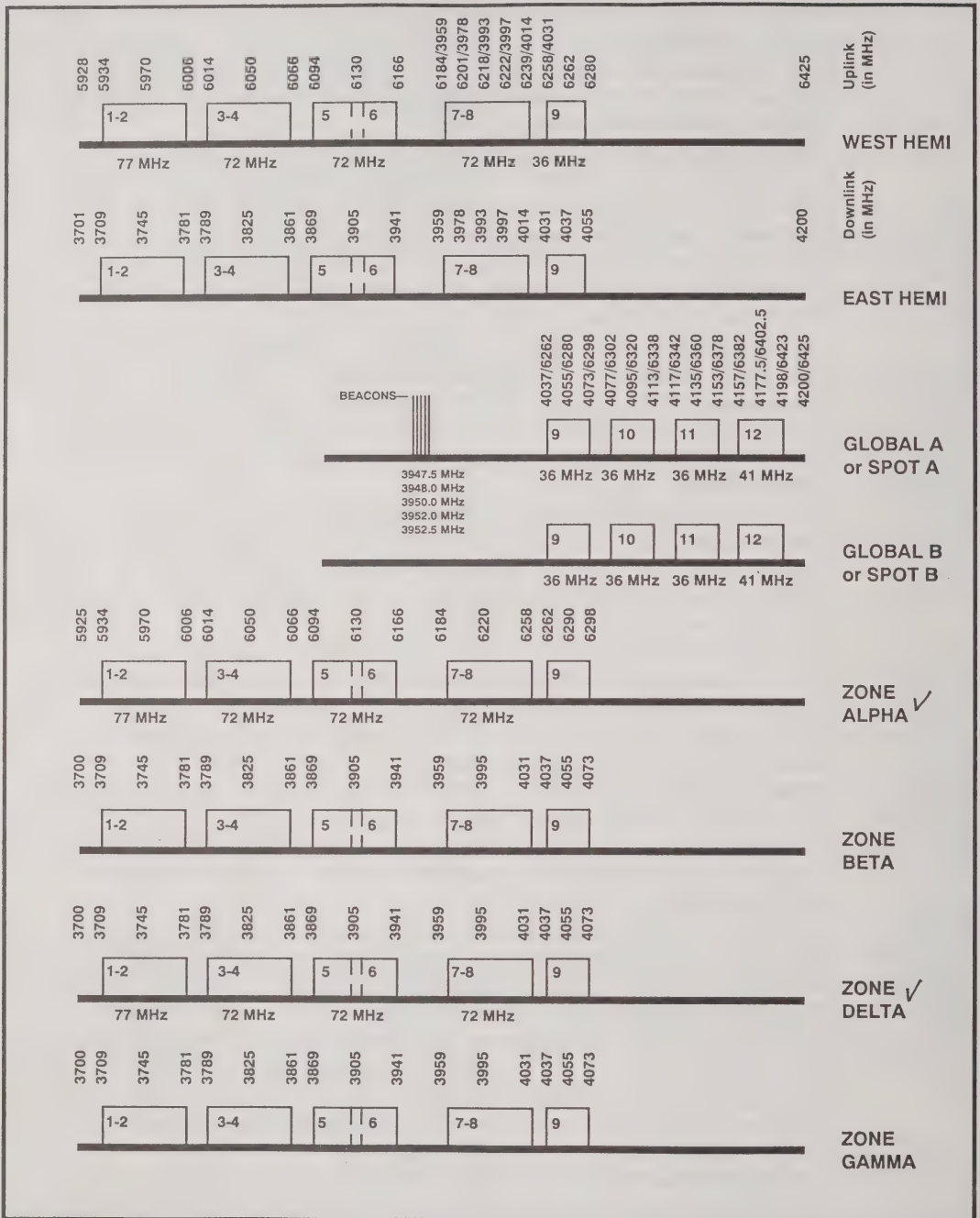
C-band Zone 1 and Zone 2 transponders also can be allocated in a criss-cross configuration: a Zone 1 signal can be uplinked to either a Northwest beam or a Southwest beam or both, and downlinked through either the Northwest beam or Southeast beam. Similarly, a Zone 2 transponder can be uplinked by either a Northeast beam or a Southwest beam or both, and downlinked to either the Northeast beam or the Southwest beam. The uplink Zone 1 beam selection is made prior to entering the receive antenna, and therefore applies to all Zone 1 transponders. The downlink Zone 1 beam selection is made prior to entering the output multiplexer and therefore allows separate beam selection (Northwest or Southeast) for each Zone 1 transponder. The Zone 2 transponder configuration follows the same principle (as a block for the uplink, independently for each transponder on the downlink).

The INTELSAT VII communications payload also provides ten Ku-band transponders (72, 77 & 112 MHz bandwidths available) with twelve possible Ku-band uplink channels (split uplink channel 5-6). Four selectable Ku-band frequency ranges (the 10.95 to 11.2 GHz, 11.45 to 11.7 GHz, 11.7 to 11.95 GHz or 12.5 to 12.75 GHz bands) allow INTELSAT VII to conform to the requirements of the ITU region being served.

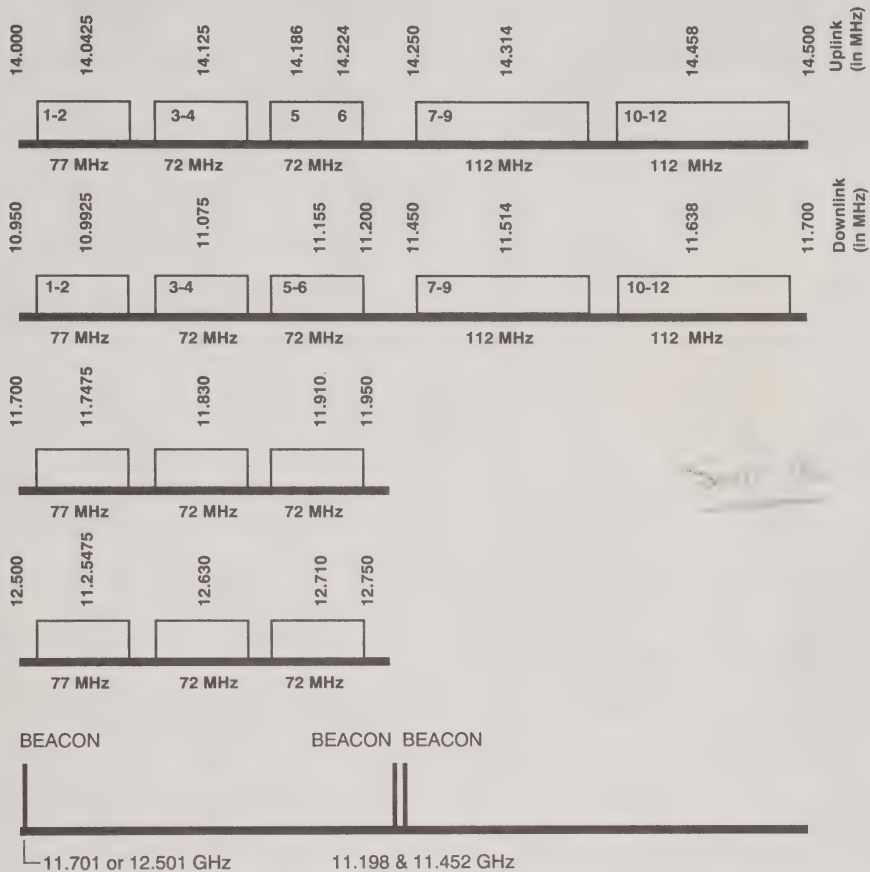
Three fully-steerable Ku-band spot beams provide additional flexibility. Spot 1 (S1) is an elliptical beam with a 1.3 degrees by 2.7 degrees inner contour and a 1.9 degrees by 4.3 degrees outer contour. Spot 2 (S2) is an elliptical beam with a 2.0 degrees by 3.5 degrees inner beam and a 3.0 degrees by 5.4 degrees outer beam. When operated in an enhanced mode, Spot 2 can provide simultaneous coverage of Asia and Southeastern Australia from satellites positioned at either 174 or 177 degrees East Longitude. Spot 3 (S3) is a circular beam with a 2 degrees inner contour and a 2.75 degrees outer contour.

In-orbit attitude inversion allows INTELSAT VII satellites to rotate 180 degrees on their yaw axis to optimize beam coverage at specific orbital locations. The development of attitude inversion has permitted INTELSAT to forego the use of more expensive and complex reconfigurable phased arrays for the INTELSAT VII antenna payloads. Normal coverage of the Pacific Ocean Region calls for a wide West hemispheric beam and a narrow East hemispheric beam. Through attitude inversion, INTELSAT VII also can have a narrow West hemispheric beam and a wide East hemispheric beam for use at other orbital locations around the globe.

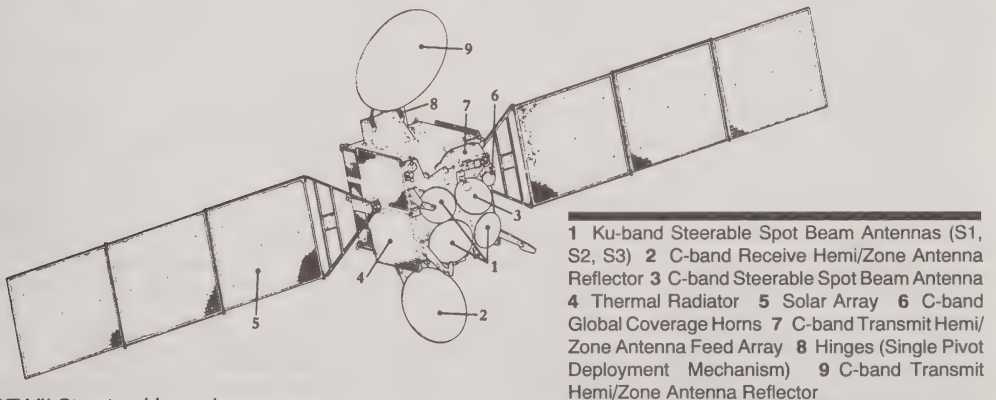
Moreover, an automatic attitude control capability minimizes the reduction in effective coverage area whenever INTELSAT VII satellites are operated in an inclined orbit, extending operations by four years when earth stations



INTELSAT VII C-band transponder layout



INTELSAT VII Ku-band SPOT 1, 2, OR SPOT 3 transponder layout



INTELSAT VII Structural Layout.

INTELSAT VII Ku-band S1 and S2 Spot beams from 177 degrees East Longitude



EIRP	35 Watts	50 Watts
S1 Inner contour:	45.4 dBW	46.7 dBW
S1 Outer contour:	43.4 dBW	44.6 dBW
S2 Inner contour:	44.5 dBW	45.8 dBW
S2 Outer contour:	41.4 dBW	42.6 dBW

INTELSAT VII Ku-band S1 and S2 beams from 66 degrees East Longitude



EIRP	35 Watts	50 Watts
S1 Inner contour:	45.4 dBW	46.7 dBW
S1 Outer contour:	43.4 dBW	44.6 dBW
S2 Inner contour:	44.5 dBW	45.8 dBW
S2 Outer contour:	41.4 dBW	42.6 dBW

INTELSAT VII C-band Hemi & Zone beams from 177 degrees East Longitude



EIRP	
Hemi beam edge:	33 dBW
Zone beam edge:	33 dBW
Global beam edge:	26, 28.5, or 29 dBW

INTELSAT VII C-band Hemi & Zone beams from 66 degrees East Longitude



EIRP	
Hemi beam edge:	33 dBW
Zone beam edge:	33 dBW
Global beam edge:	26, 28.5, or 29 dBW

equipped with a satellite tracking capability are used.

Transponders 1-2, 3-4, 5-6, and 7-8 also have full interconnectivity between the hemispheric, zone and Ku-band spot beams. The hemispheric/zone beam for transponder 9 also may be assigned to a global or C-band spot beam.

INTELSAT VII-A

Space Systems/Loral also is constructing four INTELSAT VII-A spacecraft—modified versions of the five INTELSAT VII satellites previously ordered. INTELSAT VII-A spacecraft will have a taller body (5.2m versus 4.7m), and a larger solar array wing span (10.7m versus 8.6m) to permit an increase in the number of Ku-band transponders from ten transponders (882 MHz total bandwidth) for INTELSAT VII to fourteen transponders (1,330 MHz total bandwidth) for INTELSAT VII-A. Moreover, all fourteen INTELSAT VII-A Ku-band transponders will have an EIRP of 47 dBW versus five 47 dBW and five 44.5 dBW Ku-band transponders for INTELSAT VII. Best of all, by paralleling TWTAs and assigning them to selected transponders, it will be possible to provide a “high power” mode of operation with 49.5 dBW EIRP in up to four Ku-band transponders.

The higher power of the INTELSAT VII-A TWTAs also will allow a very substantial enlargement of the Ku-band Spot 3 circular coverage (3.3° inner diameter, 4.4° outer diameter, versus 2° and 2.75° respectively for INTELSAT VII), while maintaining inner coverage EIRP in the order of 43 dBW (with 49 watt TWTAs) to 44.5 dBW (with 73 watt TWTAs). The various combinations of co-polarized (Spot 1)/cross-polarized (Spot 1X) 49 watt TWTAs, and/or co-polarized (Spot 2)/cross-polarized (Spot 2X) 73 watt TWTAs can be assigned to Spot 3 to provide it with up to five transponders. The “high power” mode of operations with paralleled TWTAs also is available for the Spot 3 beam.

The INTELSAT VII and VII-A C-band payload configurations are similar (twenty Hemi/Zone transponders and six Global/Spot transponders), but the higher-power INTELSAT VII-A solar array also allows the INTELSAT VII-A Global/Spot EIRP to be increased to provide 29 dBW (Global mode) and 36 dBW (Spot mode) in all six Global/Spot transponders. INTELSAT VII will be able to provide such values in only two of the six transponders, the other four having 26 dBW (Global mode) and 33 dBW (Spot mode). The EIRP of the twenty Hemi/Zone transponders will be the same for INTELSAT VII and INTELSAT VII-A (33 dBW).



INTELSAT VII C-band and S3 Ku-band spot beams from 177 degrees East Longitude.

INTELSAT VIII Follow-On Spacecraft

In September of 1992, the INTELSAT Board of Governors authorized the Director General to award GE Astro - Space (now Martin Marietta Astro - Space) a contract for the construction and delivery of two INTELSAT VIII follow-on satellites (FOS) with an option for as many as five additional spacecraft. The INTELSAT VIII satellites will be based on the Series 7000 spacecraft frame. The two spacecraft are scheduled to be delivered in September of 1995 and January of 1996, respectively.

On September 15, 1993, the INTELSAT Board of Governors approved the purchase of three additional INTELSAT VIII/VIII-A spacecraft from Martin Marietta Astro - Space and the lease of one Russian Express satellite to meet growing demand for communications services on the global INTELSAT satellite system. Two additional INTELSAT VIII series spacecraft (INTELSAT 803 and 804) and one modified version (INTELSAT VIII-A/INTELSAT 805) will be ordered; options for additional VIII or VIII-A satellites may be exercised by March of 1994.

Each INTELSAT VIII satellite will carry thirty-two C-band transponders in two hemispheric and four zone beams to achieve a six-fold reuse of the frequency band; each transponder would provide an EIRP of 36 dBW over most of the areas covered by the beams—the highest C-band power level ever for an INTELSAT satellite. In addition, the spacecraft would contain six high power global beam transponders, and three to six Ku-band transponders at 47 dBW.

INTELSAT VIII spacecraft will provide significantly more C-band capacity for public switched telephony and INTELSAT Business Service, better quality for video services, and encourage new international VSAT applica-

INTELSAT VIII Satellite Communications Payload Specifications

<i>Number of satellites:</i>	Four Martin Marietta Astro - Space Series 7000 platforms with options for additional spacecraft.
<i>Communications Subsystem:</i>	Provides 8 composite coverages for the hemi/zone beams. C-band repeater comprises twenty-eight variable power 10- to 20-watt SSPAs and twenty-four, variable power 27- to 30-watt SSPAs. Ku-band repeater comprises five 40-watt TWTAs Hemi/zone antenna features two shaped-beam multihorn feed arrays and two deployable reflectors. Global antenna features three corrugated horns mounted on an independent platform. Ku-band spot beam antennas feature steerable, dual-reflector assemblies.
<i>Number of Channels:</i>	Hemi/zone = 32; Global = 6; Spot beam = 3.
<i>Launch Dates:</i>	1995 & 1996.

tions. The INTELSAT 803 and 804 spacecraft in particular will be used to meet the needs of INTELSAT users in the Indian/Asia-Pacific and Eastern Atlantic Ocean Regions, respectively, for improved C-band coverage and service.

The modified INTELSAT 805 land mass satellite will feature expanded C-band and Ku-band coverages and other technical enhancements to increase effectiveness for customers in the Asia/Pacific Region. For instance, INTELSAT 805 will have a minimum C-band EIRP of 36 dBW and fully maneuverable Ku-band beams that will cover all of China, Korea, and most of Japan. Also, for flexible response to market requirements, INTELSAT 805 will be able to provide circular or linear polarization via C-band frequencies.

INTELSAT also agreed to lease an Express satellite from Informkosmos of Russia for a period of five years, beginning operations in June of 1994. The Express spacecraft has ten C-band 36-MHz wide transponders and two Ku-band 36-MHz-wide transponders which will provide short-term satellite capacity to meet increasing demands for INTELSAT satellite services in the Asia-Pacific Region. The Board exercised the first of three options previously negotiated between the two organizations.

Express At A Glance

Spacecraft type:	Three-axis stabilized
Spacecraft Manufacturer:	NPO-PM (Russia)
Satellite Mass:	2,500 kg
Electrical Power	2,700 watts
Stationkeeping Accuracy:	±0.2 degrees
Frequency Bands:	6/4, 14/11
INTELSAT Orbital Location:	95 degrees East Longitude
<i>Transmit Beams (C-band):</i>	
Global 17° x 17° (Tr. 6)	PFD: -130 dBW/m ² EIRP: 32.6 dBW
Global 15° x 15° (Tr. 7 to 11, 15 & 17)	PFD: -133 dBW/m ² EIRP: 25.9 or 30.4 dBW*
Zone 5° x 11° (Tr. 7 to 11, 15 & 17)	PFD: -127 dBW/m ² EIRP: 31.7 or 36.2 dBW*
Spot 5° x 5° (Tr. 6, 14 & 16)	PFD: -120 dBW/m ² EIRP: 35.2 or 43.1 dBW*
<i>Transmit Beams (Ku-band):</i>	
Spot 5° x 5° (12 & 20)	PFD: -127 dBW/m ² EIRP: 36.2 dBW
<i>Receive Beams</i>	
Global 17° x 17° (Tr. 6, 7 to 11, 15 & 17)	G/T: -14 dB/K
Zone 5° x 11° (Tr. 6 to 11, 15 to 17)	G/T: -7 dB/K
Ku-band Spot 6° x 6° (Tr. 12 & 20)	G/T: -5 dB/K

*Low power versus high-power modes. (Note: All EIRPs are - 2 dB from peak saturated transponder values.)

INTELSAT Plans Orbital Expansion

A new fourth "Land Mass" region, in addition to the three regions currently served by INTELSAT, has been established to combat increasing competition and shortage of capacity in the Pacific Rim. The new region, which may be called either the "Eastern Asia" or "Eastern Indian Ocean Region", consists of orbital positions over Southeast Asia at 69, 85, 91.5 and 95 degrees East Longitude. INTELSAT began operations at the 91.5 degrees East Longitude location with the relocation of INTELSAT 501 in the first quarter of 1993. The new location allows for direct links between Australia, Japan and the Western Pacific Islands to Central and Eastern Europe, as well as direct connectivity with Russia and the Central Asian Republics of the Commonwealth of Independent States (CIS).

In December of 1993, INTELSAT announced preparations for the launch of fourteen new INTELSAT satellites during the next three years:

Satellite Launch Services. INTELSAT announced the selection of Ariespace as the launch vehicle provider for two INTELSAT VIII spacecraft (INTELSAT 803 and INTELSAT 804) ordered in September of 1993. Both spacecraft will be launched by Ariane 44P launch vehicles under the terms of an existing contract with Ariespace. Scheduled for launch in 1996, the INTELSAT 803 and INTELSAT 804 spacecraft will be deployed to orbital locations in the Indian Ocean/Asia-Pacific Region and the Atlantic Ocean Region, respectively. The Board intends to select a launch vehicle provider for the INTELSAT VIII-A spacecraft (INTELSAT 805) ordered in September, 1993, at its next meeting in March, 1994.

Satellite Deployment. The Board also approved the deployment of INTELSAT 702 in the first quarter of 1994 to 359 degrees East (1 degree West) Longitude to provide service to the Middle East, Africa, Europe, and the East coasts of North and South America. Upon replacement, INTELSAT 512—the present occupant of the 359 degrees East Longitude location—will relocate to 338.5 degrees East Longitude. INTELSAT 502 will then be moved from 338.5 to 319.5 degrees East Longitude.

Orbital Locations. During the next several years, INTELSAT intends to relinquish some orbital slots and register for the use of new ones. For instance, INTELSAT operations at 63 degrees East Longitude will be transferred to 62 degrees East Longitude after the completion of the ITU coordination and notification procedures for 62 and 64 degrees East Longitude. INTELSAT is taking this action—and registering the networks indicated below—to enhance regional coverage, and to create additional slots for future satellites.

The Board has endorsed Management's intent to register networks for INTELSAT VI, VII/VII-A, and VIII satellites at 62, 64, 338, and 340 degrees East Longitude; INTELSAT VII/VII-A and VIII satellites at 330.5 degrees East Longitude; and INTELSAT V-A, VII/VII-A and VIII satellites at 157 degrees East Longitude.

INTELSAT Satellite Services for the Asia/Pacific Region

Countries within the Asia/Pacific Region currently use a combination of nine INTELSAT satellites in the geostationary arc stretching from 57 degrees to 183 degrees East Longitude. In 1992, INTELSAT provided nearly 30,000 full-time channels in the region, representing an increase of 55 percent over the previous two years. During 1992, INTELSAT had a total of forty-eight long-term leases serving the Asia/Pacific Region. Approximately 630 MHz of INTELSAT satellite bandwidth is used for domestic telecommunications purposes by various countries within the region, including China, Japan, Korea, Pakistan, and Thailand, with an additional 396 MHz of bandwidth under reservation to fulfill anticipated future growth between now and 1995.

Occasional-Use News and Sports Feeds

Transmitting video programming is a vital role of the INTELSAT satellite system. Many news and sports broadcasters use INTELSAT global beams on an occasional-use, or part-time, basis to supply news and sports program feeds to affiliate networks worldwide.

Occasional-use TV traffic on INTELSAT's Pacific Ocean Region satellites now accounts for more than 30 percent of the total occasional-use traffic on the entire worldwide INTELSAT system, a dramatic reversal over the past, when occasional-use traffic in the POR was a relatively infrequent occurrence. International users today include the American broadcast networks and cable TV services such as CNN and ESPN, major TV networks in Australia and New Zealand, Japanese networks such as NHK, KDD/Keystone, Fuji TV, Tokyo Broadcasting, and TV Asahi, and international news organizations such as Reuters TV and World Television News (WTN).

Many of these feeds originate from transportable satellite uplinking stations. As of 1992, there were thirty-nine transportable uplinks registered to operate in the Asia/Pacific Region, primarily for satellite news gathering activities.

Live sports coverage of events such as the *Olympics*, the *World Cup Soccer*, and the *Asian Games* are transmitted around the world by INTELSAT global beams. In 1992, for example, INTELSAT provided coverage of the Summer Olympic Games to over 150 countries with a record-setting twenty-one short-term leases that transmitted twenty-four television channels. In addition to the leases, INTELSAT satellites carried a total of 4,695 hours of occasional-use video.

Political summits, natural disasters, and armed conflicts also fuel demand for global beam coverage. Blocks of transponder time have been reserved at four regional INTELSAT satellite locations for serving the needs of international news services: 60 and 63 degrees East Longitude over the Indian Ocean Region, and 174 and 180 degrees East Longitude over the Pacific Ocean Region. Other capacities, particularly in the Ku-band, are made available on an *ad hoc* basis.

The new INTELSAT VII-A switchable feature will provide connectivity

between the Ku-band Spot 3 uplink channel (12) and the global "A" or "B" C-band downlink channel (12) whenever it is desired. This feature of the INTELSAT VII-A satellites is expected to further promote the growth of satellite news gathering services by allowing special events to be broadcast from on-site by small transportable uplink stations. The satellite's Ku-band Spot 3 beam will be steered to provide optimum reception of signals from the site. Signals uplinked at Ku-band will then be downlinked to the C-band global channel (38—4.1775 GHz) that already is used widely for occasional-use TV services.

Multiple Access Guaranteed Service

On July 1, 1991, INTELSAT introduced a new Multiple Access Guaranteed Service, designed to make maximum use of the inherent multi-point capability of satellites. The new service eliminates the additional cost of sending programs to more than one country by abolishing the additional charges for each downlink. The service includes significant incentives for off-peak usage.

Under this offering, the service can be used for as many separate transmissions (within a specified timeframe) as the participating countries can implement, with a coordinating Signatory controlling the "hot-switching" among the different earth stations. The Multiple Access Guaranteed Service supersedes the Multiple Origination/Destination Television Service which was introduced by INTELSAT in 1988 to accommodate emerging regional news exchange services.

Material that is not time-sensitive can be transmitted at an off-peak tariff, which is 80 percent lower than peak rates. Off-peak tariffs apply from 23:00 - 04:00 GMT in the Indian Ocean Region and 16:00 - 21:00 GMT in the Pacific Ocean Region.

New users have included the Asia-Pacific Broadcasters Union which now participates in the Asiavision News Exchange Service. This news exchange service allows countries to transmit and receive news material on virtually any subject at extremely modest costs.

Full-Time TV Leases and Transponder Sales

As of early 1993, INTELSAT had a total of twenty full-time TV leases serving the Asia/Pacific Region, comprising 972 MHz of bandwidth. These leases are either for international or domestic purposes.

International TV Lease Services

Because of the incredible increase in worldwide demand for video services, INTELSAT has established an international TV service that allows for full-time, 24-hours-a-day television over a dedicated network. Today, users continually send and receive transmissions on more than thirty channels that have been set aside for full-time international TV services.

Full-time international TV transponders are used internationally to ex-

change programming with other TV networks and news organizations, and to distribute programming to end users. In the Pacific Ocean Region, Australia's Channel 7, Channel 9, and Channel 10; Japan's NHK, Fuji TV, KDD/Keystone, Tokyo Broadcasting, and TV Asahi; and TV New Zealand all have dedicated transponders on the INTELSAT satellites located at 183, 180, or 177 degrees East Longitude. Fuji TV reportedly soon will convert to a 45 Mb/s digital international lease so that the broadcaster can transmit TV programs in a High Definition Television (HDTV) format.

American cable TV programmers such as CNN and ESPN have dedicated transponders in the Pacific Ocean Region for the international distribution of their full-time cable TV services. U.K. programmers also use INTELSAT to transmit video into the Asia/Pacific Region. The BBC World Service Television has a full-time TV lease on an Indian Ocean INTELSAT satellite for relaying its news service to Hong Kong, for use by Asian programmer STAR TV. Satellite Information Services (SIS) also uses INTELSAT to send live coverage of U.K. horse races to Sri Lanka. Chicago Chinese Television recently began receiving one hour a day of digital TV transmissions from Hong Kong. This service is digitally compressed using the SpectrumSaver system developed by CLI of San Jose, California.

American Forces Radio and Television Service (AFRTS)

The U.S. Department of Defense leases five INTELSAT transponders to provide live and taped American TV programming to 1.5 million American military personnel and their families based around the world. In the Asia/Pacific Region, the INTELSAT satellite stationed at 180 degrees East Longitude relays AFRTS programming to U.S. forces in Alaska, Australia, Japan, South Korea, Marshall Islands, New Zealand, Okinawa and the Philippines.

Worldnet

Worldnet—a TV service of the United States Information Agency—is relayed around the world to American embassies, consulates and commercial cable TV networks through the INTELSAT system. During off-hours, Worldnet satellite capacity is used to transmit C-SPAN—coverage of the U.S. House of Representatives, Senate, and special programs and interviews—or the German-language Deutsche Welle TV service. In the Asia/Pacific Region, Worldnet uses transponders aboard INTELSAT satellites stationed at 63 degrees East Longitude over the Indian Ocean and 180 degrees East Longitude over the Pacific Ocean Region.

INTELSAT Voice and Data Services

International and domestic TV distribution may be the most visible part of INTELSAT's role as an international telecommunications carrier, but it is only the tip of the iceberg as far as the total amount of INTELSAT traffic is concerned. Over 60 percent of INTELSAT's revenue is derived from its role

as a provider of International Public Telecommunication (IPT) links.

Digital full-time service in the Asia/Pacific Region has grown by over 25 percent during the past two years. At the present time, there is twice the amount of digital traffic in the region as conventional analog FDM.

Digital technology has become the preferred way for processing much of the world's communications traffic because of the operational and cost efficiencies that can be achieved. IDR is a digital public-switched service which INTELSAT has developed to relay international public-switched telephony. IDR is available at transmission rates from 64 kb/s up to 44.736 Mb/s. IDR is used both domestically and internationally for voice communications, data transmissions, digital television, videoconferencing, and printed material distribution. IDR also works in tandem with integrated services digital network (ISDN) applications and dedicated private digital networks. Since IDR works with earth stations as small as 4.5m in diameter, it offers users a cost-effective alternative for providing gateway communications services.

INTELSAT has adopted digital bearer tariffs and digital circuit multiplication equipment (DCME) specifications—two important steps in making the IDR service cost-effective and competitive. By using DCME with an IDR bearer circuit—a circuit that can be divided by DCME to carry more than one derived circuit—a user can obtain up to five times more voice service than could be accomplished using conventional technology with the same amount of capacity. Cost benefits are enhanced by the ability to interconnect IDR services with existing or planned domestic digital networks.

Time Division Multiple Access (TDMA) is another ISDN-quality service used to transmit public-switched telephony traffic of very large volume. Like IDR, TDMA also is offered on a bearer channel basis so that DCME may be used to derive multiple channels at no additional space segment charge.

INTELSAT Business Service

The INTELSAT Business Service (IBS) is an integrated digital private network offering, available as a channel service (from 64 kb/s to 8.448 Mb/s) as well as on a full or fractional transponder lease basis. IBS services in the Asia/Pacific Region have grown by more than 100 percent during the past two years. IBS customers in the region utilize the service for a wide variety of private network data and voice requirements. In India, for example, IBS is used to support a remote software programming industry, while in Singapore, users such as Texas Instruments Singapore use IBS services provided by Singapore Telecom to stay in touch with its Dallas, Texas, headquarters.

In Malaysia, IBS is used by multinational electronics manufacturing companies operating in Malaysia's Industrial Free Trade Zone areas to communicate with their offices overseas. All of this traffic is routed over INTELSAT satellites stationed at 63 degrees and 174 degrees East Longitude.

In Japan, KDD—INTELSAT's Japanese Signatory—offers a high-speed digital private line service called "HI-BITLINK," which has more than six hundred 64 kb/s IBS circuits. These circuits are used to link Japan with more than twenty-five other countries. Capacity aboard the INTELSAT satellites stationed at 60 and 63 degrees East Longitude, and 174 and 177 degrees East Longitude, is used to relay this service overseas.

In China, INTELSAT's IBS service is used to provide both international and domestic services. Internationally, the service links businesses in Shanghai and Beijing with locations in Japan and the United States via the INTELSAT satellites located at 174 and 177 degrees East Longitude. Domestically, IBS is now providing more than 100 domestic voice communications channels between Shanghai and Nanking.

Occasional-use IBS also handles videoconferences on a regular basis. Singapore and Japan, for example, have established extensive IBS videoconferencing networks.

Intelnet

Intelnet, INTELSAT's VSAT (Very Small Aperture Terminal) service, offers users the opportunity to design custom networks—optimized for a wide range of data and voice requirements—with a minimum of technical and operational restrictions. The Intelnet service supports multipoint networks operating with VSATs as small as 0.6m in diameter. Intelnet has evolved with the development of VSAT technology, making it possible to operate with any modulation or access technique as needed to meet changing customer requirements.

The world's leading international news agencies use Intelnet for the distribution of their news and photo services over all three Ocean Regions. Reuters, for example, uses 18 MHz of global beam capacity on the INTELSAT satellite at 63 degrees East Longitude to transmit 168 kb/s of data to customers' offices within the Region. The service is uplinked from Hong Kong by Hong Kong Telecom.

The use of VSAT terminals makes Intelnet a useful service for communicating with isolated locations. Through Intelnet, for example, a remote mining site in Indonesia now communicates directly with its head office in Australia. While previous communications links were limited to HF radio telegraphy, this mining site now has high-speed access to its head office using file transfer and electronic mail applications.

The Pacific Area Cooperative Telecommunications (PACT) Network has been using INTELSAT capacity since 1990 to provide cost effective, high quality, thin route communications for eleven Pacific island nations. Operated by Telstra Corporation Ltd., of Australia, PACT is a demand-assigned, multiple-access service that represents the major international and inter-island communications link for many PACT participants.

The People's Republic of China has a 5 MHz Intelnet lease on the INTELSAT VI satellite located at 63 degrees East Longitude. This lease provides the

Xinhua News Agency with data broadcasting and newspaper remote printing services.

Other prominent applications for the Intelnet service include remote data processing, reservation and booking confirmations, electronic funds transfers, and data base access. These services are provided to government agencies and industries such as manufacturing, tourism, banking, and shipping.

Domestic/Regional Services

INTELSAT has offered domestic services since 1973. Domestic networks are tailored to meet the specific communications requirements of a country or region in terms of traffic and geographical constraints. Currently, the major applications for these domestic services are television distribution and telephony. However, more and more countries are beginning to use INTELSAT domestic services to support business networks within their respective territories. These business systems include point-to-point IBS-type networks as well as VSAT-based point-to-multipoint networks for banking and other financial systems.

As of September 15, 1993, INTELSAT was providing domestic leases to the following countries in the Asia/Pacific Region: China, India, Malaysia, Pakistan, Thailand, and the United Kingdom (for Hong Kong). In addition, the following Asia/Pacific countries had purchased INTELSAT capacity: China, Iran, Israel, Japan, Turkey, and the United States (on behalf of Taiwan).

Transponder for Unrestricted Use and VISTA

Under the Transponder for Unrestricted Use (TUU) program, customers can lease bulk transponder capacity to provide whichever international, regional, or domestic communications services they wish. The TUU service has been designed to provide greater flexibility to users—particularly those with heavy traffic demands.

Vista was designed to meet the needs of INTELSAT users in isolated or remote communities with low-density traffic streams. Vista is available as both an analog and digital service.

Cable Restoration Service

INTELSAT has been restoring the world's fiber optic and other submarine cables for more than twenty-five years. INTELSAT's major part in the restoration of transoceanic analog cables recently has been complemented, or even overtaken, by the primary role it has assumed in the restoration of the new digital fiber optic cables in the Pacific Ocean Region. As of early 1993, there were twenty-eight 36-MHz units of cable restoration leases on INTELSAT satellites serving the Pacific Ocean Region.

Chapter Four:

The Asiasat and Apstar Regional Satellite Systems

Asia Satellite Telecommunications Co., Ltd.

23-24/F, East Exchange Tower

38-40 Leighton Rd.

Hong Kong

Tel: (852) 805-6666

Fax: (852) 576-4111

Chief Executive Officer: Peter Jackson

Public Relations: Lindy Wong

On April 7, 1990, Asiasat 1—the first commercial communications satellite designed for Asian countries—was launched to 105.5 degrees East Longitude by the China Great Wall Industry Corporation's Long March 3 rocket. Asiasat is a regionally-based satellite system owned by Asia Satellite Telecommunications Co., Ltd. Formerly known as Westar VI, Asiasat 1 initially was built by the Hughes Aircraft Company for Western Union. Westar VI was launched in 1984, but the satellite's Payload Assist Module (PAM) failed to boost the satellite into a geostationary orbit. In 1985, a special Space Shuttle mission retrieved the unused satellite and returned it to Earth. The satellite subsequently was sold to the Asiasat consortium.

Each of Asiasat's twenty-four transponders is capable of carrying one analog television channel or 1,200 telephone calls. The satellite is providing a wide range of high-quality telecommunications services, including telephone, telex, facsimile, high-speed data transmission and TV broadcasting.

Asiasat 1 generates regional spot beams centered over Pakistan and Thailand. The North Asia spot beam covers China, Hong Kong, Taiwan, Korea, Nepal and Western Japan. The South Asia Spot covers Thailand, Pakistan, Malaysia, Singapore, Vietnam, Laos, Cambodia (Kampuchea), Myanmar (Burma), Bangladesh, Nepal, Afghanistan, and Iran.

Asiasat Telecommunication Traffic

Countries which are voice and data users of Asiasat-1 include the People's Republic of China (PRC), Korea (South), Mongolia, Myanmar (Burma), Taiwan, and Thailand. Asiasat's thin routes are narrow communication pathways for small earth stations. Thin routes can be used for rural

telephony or for private networks. A typical thin route network can provide service to users such as banks, air traffic controllers and news agencies with antennas 3m in diameter. Each station can carry up to four voice or data channels. Thin route stations can provide networks in areas where there is a poor communications infrastructure.

Asiasat trunk routes are high-speed telecommunications highways capable of carrying multiple voice or data circuits between major cities. Trunk routes require the use of earth stations that are 7m in diameter.

Asiasat also transmits TV programs to major cities and small communities. Small 3m antennas can be used to receive commercial programs for cable distribution or educational TV for schools.

Asiasat TRUNK ROUTES
(using a 7m Earth Station)

Carrier Rate Mb/s	45	02
Carriers Per Tr.	01	16
Voice Channels (using AD-PCM)†	1344	960
Voice Channels (using DCME)††	3360	2400

†Adaptive Differential Pulse Code Modulation

†† Digital Circuit Multiplication Equipment

Asiasat Ownership

Asia Satellite Telecommunications Co., Ltd., is owned in equal shares by Cable and Wireless plc, the China International Trust and Investment Corporation Holdings (or CITIC), and Hutchison Whampoa Limited. The Cable and Wireless Group is committed to the cost-effective, state-of-the-art technology for providing services to meet the growing demands of its customers in over forty-seven countries. This commitment is reflected in the Group's objective of establishing a global digital network connecting primary economic and financial centers around the world.

The Group's major subsidiary is Hong Kong Telecommunications Ltd., which was formed from the merger of Hong Kong Telephone Company Ltd., and Cable and Wireless (Hong Kong) Ltd. These companies and their forerunners have provided local and international telecommunications to Hong Kong for more than a century.

Hong Kong Telephone Co., and Cable and Wireless (Hong Kong) are franchised to provide business and residential customers with a wide range of telecommunications services, including domestic and international telephone, facsimile, and telex. The Hong Kong Telephone network contains one of the world's largest urban optical-fiber networks. International communi-

cations are supported by five satellite dishes at the Stanley earth station in Hong Kong, connected to INTELSAT geostationary satellites over the Pacific and Indian Oceans.

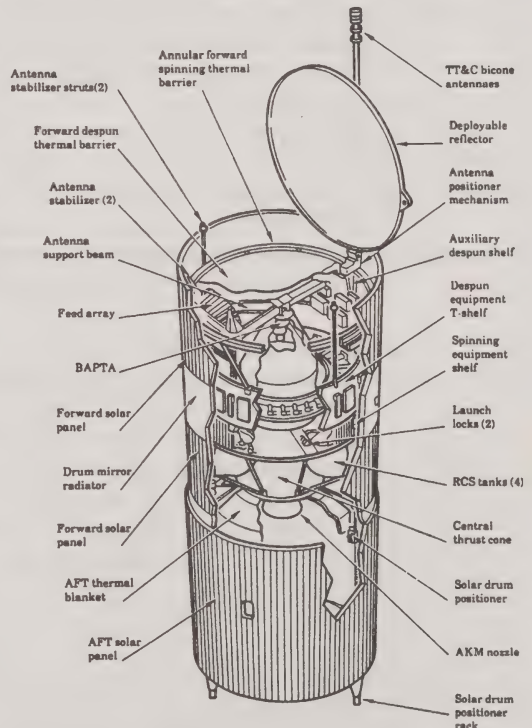
The China International Trust and Investment Corporation (Holdings), or CITIC, was formed in October of 1979 under the direct leadership of the State Council of the People's Republic of China. CITIC is involved in trade and finance ventures, both in China and worldwide. CITIC has invested in more than 200 joint ventures in China. CITIC overseas investments include the second cross-harbour tunnel and Cathay Pacific in Hong Kong, and investments in numerous projects in the United States, Canada, Japan, Great Britain, Australia, Germany, Thailand, and the Persian Gulf.

Hutchison Whampoa Limited is one of Hong Kong's oldest, largest, and most profitable companies. The company holds a solid and highly diversified portfolio of leading companies involved in property development and management, importing and exporting, retailing, quarrying, telecommunications, container terminal operations, power generation and supply, oil and gas, and China trade.

Hutchison Whampoa Limited is involved in Asiasat through a wholly-owned subsidiary known as Hutchison Telecommunications Ltd. Hutchison Telecom provides a variety of services within Hong Kong, including cellular mobile telephone, paging, and on-line database services.

STAR TV Program Lineup

Eleven Asiasat transponders—five in the Northern beam and six in the Southern beam—are used to transmit a package of direct-to-home television services from Hong-Kong-based Hutchvision. All of Hutchvision's "STAR TV" channels air on a 24-hours-a-day basis. The STAR TV programming package includes news programming provided by the *BBC World Service Television*; a music video service produced by MTV: *Music Television*; a sports network produced by U.S.-based *Prime Sports*; the Hindi-language service *Zee TV*; and two channels produced by Hutchvision: the *Chinese Channel*, and a general entertainment service



known as *STAR Plus*.

All services are broadcast in stereo using the high-quality "Panda Sound System" developed by Wegener Communications, Inc., of the United States. Four of the five STAR TV services are broadcast in both English and Chinese. *The Chinese Channel*, however, is only available with a Mandarin-language soundtrack.

Originating from London, *BBC Asia* keeps viewers up-to-date on all world events. The service also provides extensive coverage of Asian news reports. Business developments and current affairs also are a regular part of the channel's continuous coverage.

MTV: Music Television is an Asian version of the popular American program service. This channel provides the latest music videos from such international pop stars as Madonna, Mariah Carey, Michael and Janet Jackson, and Phil Collins, as well as the performances of popular Asian musical groups. MTV also features live concerts, music news, exclusive interviews, and classic American programs such as "The Best of Saturday Night Live".

Prime Sports is Asia's first 24-hour sports channel. The channel features many popular international, American, and Asian sporting events, including live satellite coverage of the U.S. Open Tennis Tournament, Ryders Cup Golf, and cricket's World Cup series.

The Chinese Channel is dedicated to airing entertainment programming for Mandarin-speaking TV viewers throughout Asia. Specially selected programs include action-packed dramas, comedies, Chinese language music videos, and special events coverage.

STAR Plus, STAR TV's entertainment channel, offers blockbuster films, miniseries, comedies, documentaries, and selected programs from popular British and American TV series.

Zee TV, a Hindi-language service that is produced in India, was announced by STAR TV and Asiasat on August 10, 1992. The service was launched in collaboration with an Indian company—Asia Today Ltd.—on the Southern beam of Asiasat on October 2, 1992.

Other Asiasat TV Services

Additional Asiasat transponders transmit the national TV services of Burma (Myanmar TV), Pakistan, the People's Republic of China (both CCTV and Chinese Provincial Television from Guizhou and Yunnan, China), and Mongolia (Mongol Televiz). All of the Asiasat 1 TV services mentioned above can be received by antennas ranging from 6 to 10 feet (2 to 3 meters) in diameter from locations within the central contours of the satellite's Northern and Southern beams.

Market	Number of STAR Homes	% Homes	Predominant Feed Source
China	4,800,000	03%	Cable & SMATV
Hong Kong	304,809	19%	SMATV
India	3,300,500	17%	Cable
Indonesia	36,211	—	TVRO
Israel	410,000	41%	Cable
Korea	18,945	—	TVRO
Kuwait	12,780	05%	TVRO/Some SMATV
Pakistan	61,239	03%	TVRO/Some SMATV
Philippines	137,141	04%	Cable
Taiwan	1,980,140	41%	Cable
Thailand	32,393	—	TVRO/Some SMATV
U.A.E.	72,809	18%	TVRO/Some SMATV
Hotel Rooms	116,368	—	SMATV
TOTALS	11,283,335 Homes & Hotel Rooms		

SOURCE: STAR TV Home Penetration Report of February, 1993.

ASIASAT EIRP AND AZ/EL COORDINATES

Country	EIRP Range	Major City	EIRP	Azimuth/Elevation	
China	32~36 dBW	Shanghai	36 dBW	50	209
Japan	30~34 dBW	Tokyo	30 dBW	35	229
South Korea	35~35 dBW	Seoul	36 dBW	42	213
North Korea	35~35 dBW	Pyongyang	36 dBW	40	213
Mongolia	30~34 dBW	Ulan Bator	32 dBW	35	182
Georgia (CIS)		Tbilisi	32 dBW	13	110
Russia (CIS)		Vladivostok	34 dBW	33.7	216
		Irkutsk	30 dBW	30.2	178
		Astrakhan	30 dBW	12.3	114
		Rostov	30 dBW	7.6	108
Ukraine (CIS)		Sevastopol	30 dBW	4.1	103
Armenia (CIS)		Yerevan	32 dBW	13.3	110
Azerbaijan (CIS)		Baku	33 dBW	17.1	114
Turkmenistan (CIS)		Ashkhabad	35 dBW	23.5	121
Uzbekistan (CIS)		Tahkent	34 dBW	30	132
Tajikistan (CIS)		Dushanbe	35 dBW	31.4	130
Kyrgyzstan (CIS)		Osh	33 dBW	32.5	135
Taiwan	33~35 dBW	Taipei	35 dBW	55	215
Hong Kong	35 dBW	Hong Kong	35 dBW	62	202
Philippines	~ ~ 31 dBW	Manila	28 dBW	65	227
Vietnam	34~36 dBW	Hanoi	35 dBW	65	180
Cambodia	36~37 dBW	Phnom Penh	37 dBW	76	177
Laos	36~37 dBW	Vientiane	37 dBW	69	171
Thailand	35~37 dBW	Bangkok	37 dBW	73	160
Malaysia	~ ~ 35 dBW	Kuala Lumpur	35 dBW	84	127
Singapore	32 dBW	Singapore	32 dBW	88	130
Indonesia	~ ~ 33 dBW	Medan	31 dBW	81	115
Myanmar	33~37 dBW	Rangoon	32 dBW	68	150
Bangladesh	33~35 dBW	Dhaka	33 dBW	58	146
India	23~37 dBW	New Delhi	37 dBW	45	132
Bhutan	33~34 dBW	Thimphu	33 dBW	53	149
Nepal	33~35 dBW	Kathmandu	34 dBW	52	146
Pakistan	35~37 dBW	Karachi	37 dBW	40	119
Afghanistan	35~37 dBW	Kabul	37 dBW	34	128
Iran	32~36 dBW	Tehran	35 dBW	21	113
Iraq	31~33 dBW	Baghdad	33 dBW	16	107
Kuwait	33 dBW	Kuwait	33 dBW	20	107
Saudi Arabia	21~33 dBW	Riyadh	30 dBW	20	104
Bahrain	34 dBW	Bahrain	34 dBW	24	108
Qatar	33~35 dBW	Doha	35 dBW	24	107
UAE	34 dBW	Abu Dhabi	34 dBW	27	108
Oman	27~35 dBW	Muscat	35 dBW	32	107
Jordan	30~32 dBW	Amman	31 dBW	8	101
Syria	31~33 dBW	Damascus	34 dBW	9	102
Lebanon	32 dBW	Beirut	32 dBW	6	100
Turkey	31~33 dBW	Ankara	31 dBW	4	101
Israel	30~32 dBW	Tel Aviv	31 dBW	7	100
Egypt	25~31 dBW	Cairo	30 dBW	5	98
Cyprus	31 dBW	Nicosia	31 dBW	6	101

SOURCE: Asiasat Satellite Telecommunications Co., Ltd.

Audio Subcarrier Services: Asiasat 1 Southern Beam

Prime Sports [Tr. S4]	6.30 MHz	English PANDA I stereo (left)
	6.48 MHz	English PANDA I stereo (right)
	6.80 MHz	Temporary English monaural
	7.20 MHz	Mandarin PANDA I monaural
MTV: [Tr. S5]	6.30 MHz	English PANDA I stereo (left)
	6.48 MHz	English PANDA I stereo (right)
	6.80 MHz	Temporary English wideband monaural
	7.20 MHz	BBC World Service Radio 1 PANDA I Mono
BBC [Tr. S6]	6.30 MHz	English PANDA I stereo (left)
	6.48 MHz	English PANDA I stereo (right)
	6.80 MHz	Temporary English wideband monaural
	7.20 MHz	Mandarin PANDA I monaural
Zee TV [Tr. S7]	6.30 MHz	Hindi PANDA I stereo (left)
	6.48 MHz	Hindi PANDA I stereo (right)
	6.80 MHz	Temporary Hindi wideband monaural
	7.20 MHz	BBC World Service Radio 3 PANDA I mono
Entertainment [Tr. S8]	6.30 MHz	English PANDA I stereo (left)
	6.48 MHz	English PANDA I stereo (right)
	6.80 MHz	Temporary English wideband monaural
	7.20 MHz	BBC World Service Radio 2 PANDA I mono
Chinese Channel [Tr. S9]	6.30 MHz	Mandarin PANDA I stereo (left)
	6.48 MHz	Mandarin PANDA I stereo (right)
	6.80 MHz	Temporary Mandarin wideband monaural

Audio Subcarrier Services: Asiasat 1 Northern Beam

Prime Sports [Tr. N3]	5.58 MHz	English PANDA I stereo (left)
	5.76 MHz	English PANDA I stereo (right)
	5.94 MHz	Mandarin PANDA I wideband monaural
	6.20 MHz	Temporary English wideband monaural
MTV: [Tr. N4]	5.58 MHz	English PANDA I stereo (left)
	5.76 MHz	English PANDA I stereo (right)
	5.94 MHz	BBC World Service Radio 1 PANDA I mono
	6.20 MHz	Temporary English wideband Mono
BBC [Tr. N5]	5.58 MHz	English PANDA I stereo (left)
	5.76 MHz	English PANDA I stereo (right)
	5.94 MHz	Mandarin PANDA I monaural
	6.20 MHz	Temporary English wideband monaural
Chinese Channel [Tr. N6]	5.58 MHz	Mandarin PANDA I stereo (left)
	5.76 MHz	Mandarin PANDA I stereo (right)
	5.94 MHz	Mandarin wideband monaural
	6.20 MHz	Temporary Mandarin wideband monaural
Entertainment [Tr. N7]	5.58 MHz	English PANDA I stereo (left)
	5.76 MHz	English PANDA I stereo (right)
	5.94 MHz	BBC World Service Radio PANDA I monaural
	6.20 MHz	Temporary English wideband monaural

(As of August 6, 1993)

Other Audio Signal Parameters

Peak-to-peak Deviation:	100 kHz
Subcarrier Amplitude:	approximately 24 dB below video
Pre-emphasis:	75 μ s
Frequency response:	50 Hz - 15 kHz
System:	Wegener PANDA I
Compression:	20 dB

Asiasat 1 at a Glance

Operational History

Orbital Assignment:	105.5 degrees East Longitude
Launch Date:	April 7, 1990
Launch Vehicle:	Long March 3
Status:	Operational C-band satellite with regional beam coverage
Design Life:	9 to 10 years

Communications Payload

Frequency Band(s):	Receive: 5.925~6.425 GHz Transmit: 3.700~4.200 GHz
Channels:	12 with horizontal polarization 12 with vertical polarization
Channel Bandwidth:	36 MHz
Signal Power (EIRP):	37 dBW maximum
Receiver Noise:	3.8 dB
G/T:	1.0 dB/K maximum
Saturated Flux Density:	-81 to -90 dBW/m ²
Antenna Coverage:	Asia and the Middle East
TWTA Power:	8.2 watts
Capacity:	24 color TV signals

Spacecraft

Satellite Type:	Hughes HS-376 spin-stabilized
Weight At Launch:	1,250 kg (2,750 lb.)
Dimensions:	6.5m in height & 2.2m in diameter
Electrical Power:	822 watts

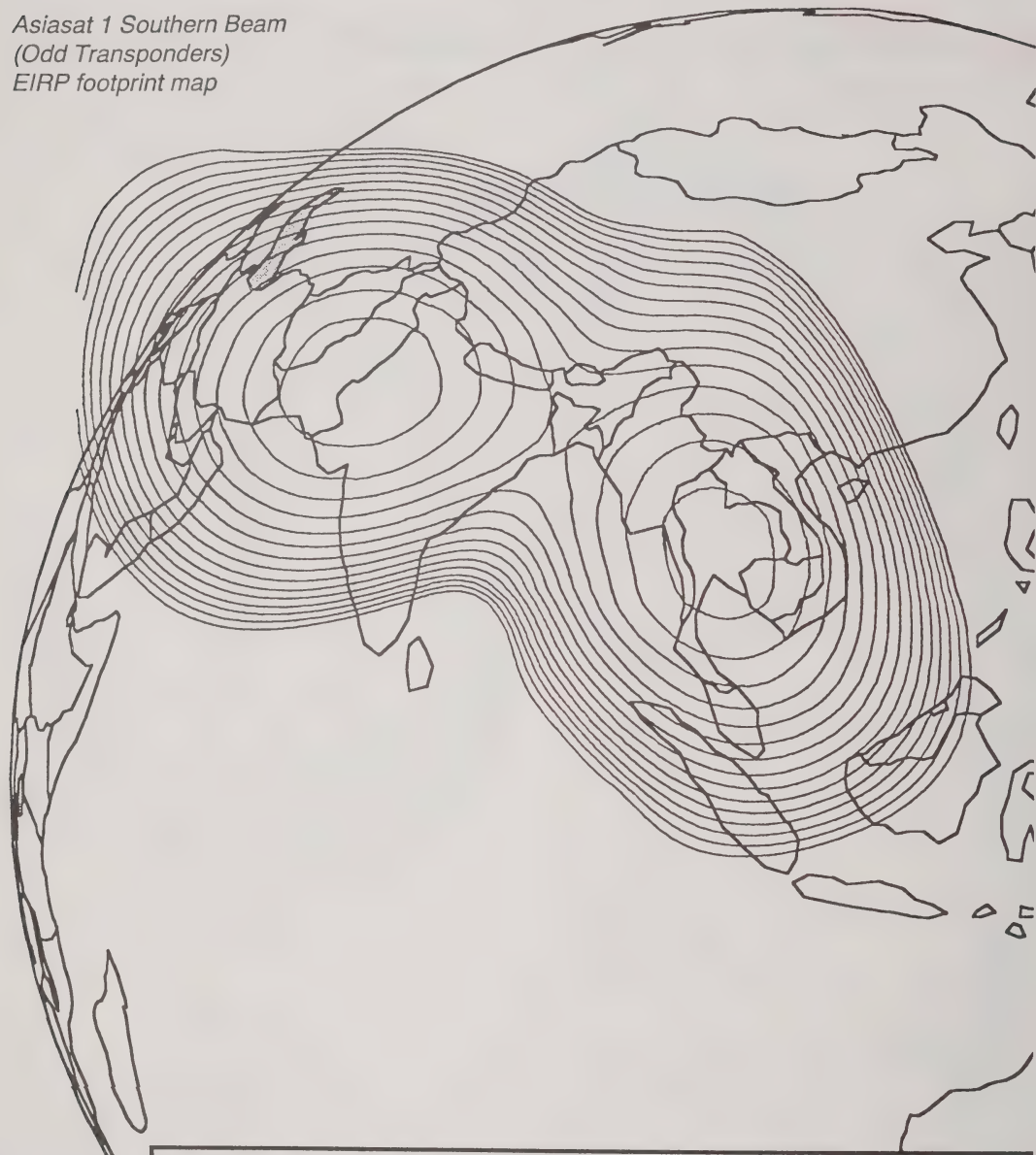
Asiasat 1 Southern Beam
(Even Transponders)
EIRP footprint map

*Vertical
ie 3980
Plane Span 380*



1st contour:	38.5 dBW	7th contour:	32.5 dBW	13th contour:	26.5 dBW
2nd contour:	37.5 dBW	8th contour:	31.5 dBW	14th contour:	25.5 dBW
3rd contour:	36.5 dBW	9th contour:	30.5 dBW	15th contour:	24.5 dBW
4th contour:	35.5 dBW	10th contour:	29.5 dBW	16th contour:	23.5 dBW
5th contour:	34.5 dBW	11th contour:	28.5 dBW		
6th contour:	33.5 dBW	12th contour:	27.5 dBW		

*Asiasat 1 Southern Beam
(Odd Transponders)
EIRP footprint map*



1st contour: 38.5 dBW
2nd contour: 37.5 dBW
3rd contour: 36.5 dBW
4th contour: 35.5 dBW
5th contour: 34.5 dBW
6th contour: 33.5 dBW

7th contour: 32.5 dBW
8th contour: 31.5 dBW
9th contour: 30.5 dBW
10th contour: 29.5 dBW
11th contour: 28.5 dBW
12th contour: 27.5 dBW

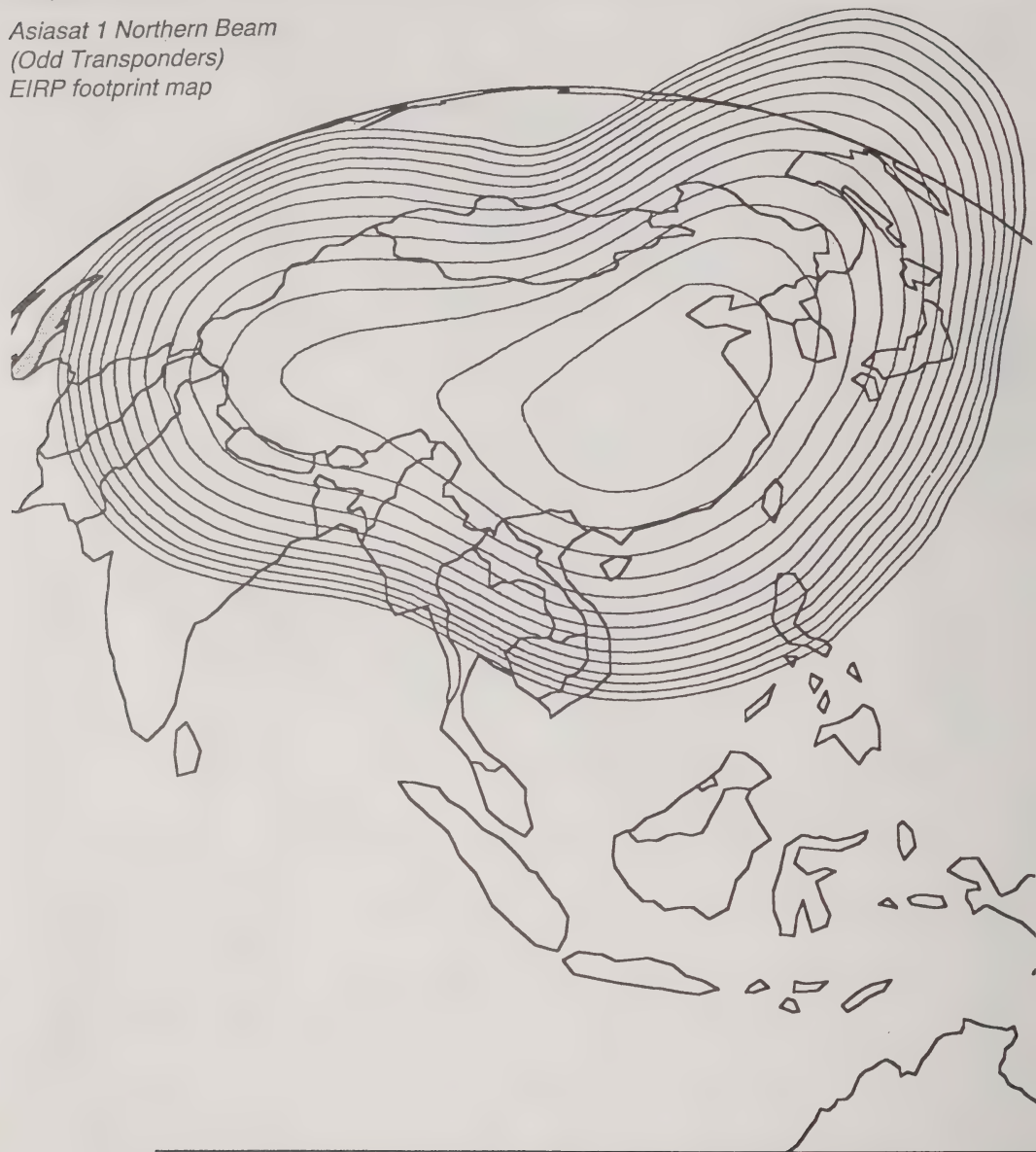
13th contour: 26.5 dBW
14th contour: 25.5 dBW
15th contour: 24.5 dBW
16th contour: 23.5 dBW

*Asiasat 1 Northern Beam
(Even Transponders)
EIRP footprint map*



1st contour:	38.5 dBW	7th contour:	32.5 dBW	13th contour:	26.5 dBW
2nd contour:	37.5 dBW	8th contour:	31.5 dBW	14th contour:	25.5 dBW
3rd contour:	36.5 dBW	9th contour:	30.5 dBW	15th contour:	24.5 dBW
4th contour:	35.5 dBW	10th contour:	29.5 dBW	16th contour:	23.5 dBW
5th contour:	34.5 dBW	11th contour:	28.5 dBW		
6th contour:	33.5 dBW	12th contour:	27.5 dBW		

*Asiasat 1 Northern Beam
(Odd Transponders)
EIRP footprint map*

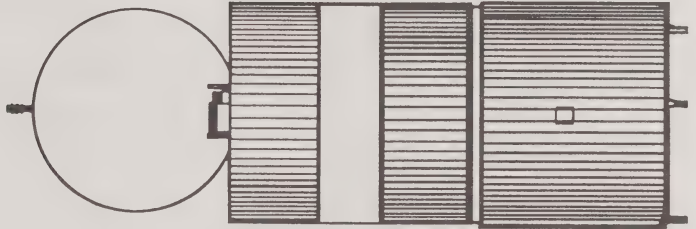
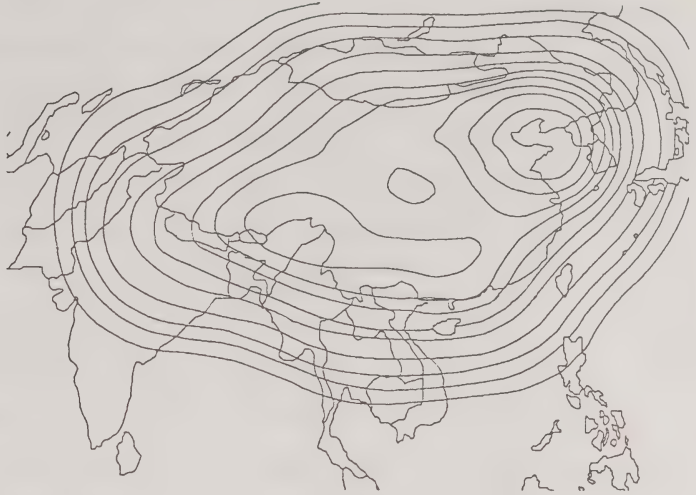


1st contour:	38.5 dBW	7th contour:	32.5 dBW	13th contour:	26.5 dBW
2nd contour:	37.5 dBW	8th contour:	31.5 dBW	14th contour:	25.5 dBW
3rd contour:	36.5 dBW	9th contour:	30.5 dBW	15th contour:	24.5 dBW
4th contour:	35.5 dBW	10th contour:	29.5 dBW	16th contour:	23.5 dBW
5th contour:	34.5 dBW	11th contour:	28.5 dBW		
6th contour:	33.5 dBW	12th contour:	27.5 dBW		

*Asiasat Northern Beam
G/T Coverage*

SFD = -91.5 - G/T

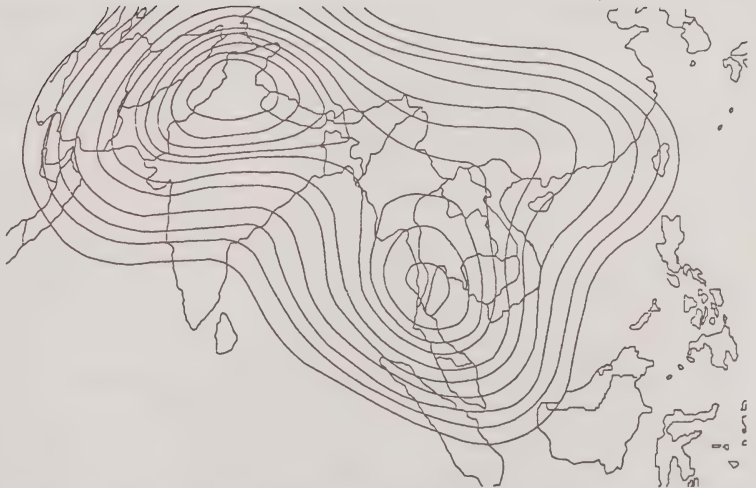
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2nd contour:	2.0 dB/K
3rd contour:	1.5 dB/K
4th contour:	1.0 dB/K
5th contour:	0 dB/K
6th contour:	-1.0 dB/K
7th contour:	-3.0 dB/K
8th contour:	-5.0 dB/K
9th contour:	-7 dB/K
10th contour:	-10 dB/K



*Asiasat Southern Beam
G/T Coverage*

SFD = -91.5 - G/T

1st contour:	2.5 dB/K
2nd contour:	2.0 dB/K
3rd contour:	1.5 dB/K
4th contour:	1.0 dB/K
5th contour:	0 dB/K
6th contour:	-1.0 dB/K
7th contour:	-3.0 dB/K
8th contour:	-5.0 dB/K
9th contour:	-7 dB/K
10th contour:	-10 dB/K



Asiasat 2

On October 26, 1992, Asiasat announced a HK\$ One Billion contract with Martin Marietta Astro - Space (MM) of Princeton, New Jersey, to build Asiasat's second generation satellite, Asiasat 2. The contract award included satellite production and delivery of one commercial communications satellite in the fourth quarter of 1994, as well as launch services and an option to take delivery of an additional satellite twelve months later. The contract was awarded to Martin Marietta Astro - Space in the face of fierce competition from Hughes of the United States and Matra Marconi, a European consortium. In parallel with the Asiasat 2 contract to Martin Marietta, AsiaSat has awarded a consultancy contract to Comsat Corporation—the U.S. Signatory to INTELSAT—to provide technical assistance to Asiasat for the spacecraft, launch vehicle, and overall mission support.

The Asiasat 2 spacecraft will use Martin Marietta's Series 7000 satellite bus. The hybrid Asiasat 2 satellite will provide twenty-four C-band transponders—twenty with a bandwidth of 36 MHz and four with a bandwidth of 72 MHz—and nine Ku-band transponders with a bandwidth of 54 MHz. The spacecraft, which will be designed to achieve a mission lifetime of fifteen years, will be compatible with a range of modern launch vehicles.

Asiasat 2's proposed C-band footprint will stretch from Tokyo to Berlin and South to Jakarta, Indonesia and portions of Australia, as well as areas in between such as the Indian subcontinent, the Middle East, and Eastern Europe. This wide coverage area contains the homes for 72 percent of the world's population. High levels of EIRP will be maintained throughout this broad area through the use of 55-watt TWTAs.

Asiasat 2's proposed Ku-band footprint will include Hong Kong, China, Taiwan, and Korea. The use of high-power 115-watt TWTAs will permit the use of Asiasat 2 for DBS operations within this coverage area.

Asiasat Signs Agreement with China Great Wall Industry Corporation

In March of 1993, Asiasat signed a launch contract with China Great Wall Industry Corporation for the launch of Asiasat 2 using a Long March 2E launch vehicle. The launch is scheduled for the first quarter of 1995 from China's Xichang launch site.

Asiasat-2 At A Glance

Operational History

Future Orbital Assignment:	100.5 degrees East
Launch Date:	Early 1995
Launch Vehicle:	Chinese Long March 2E
Status:	Contract Awarded
Design Life:	Thirteen years
Maneuver Life:	Fifteen years

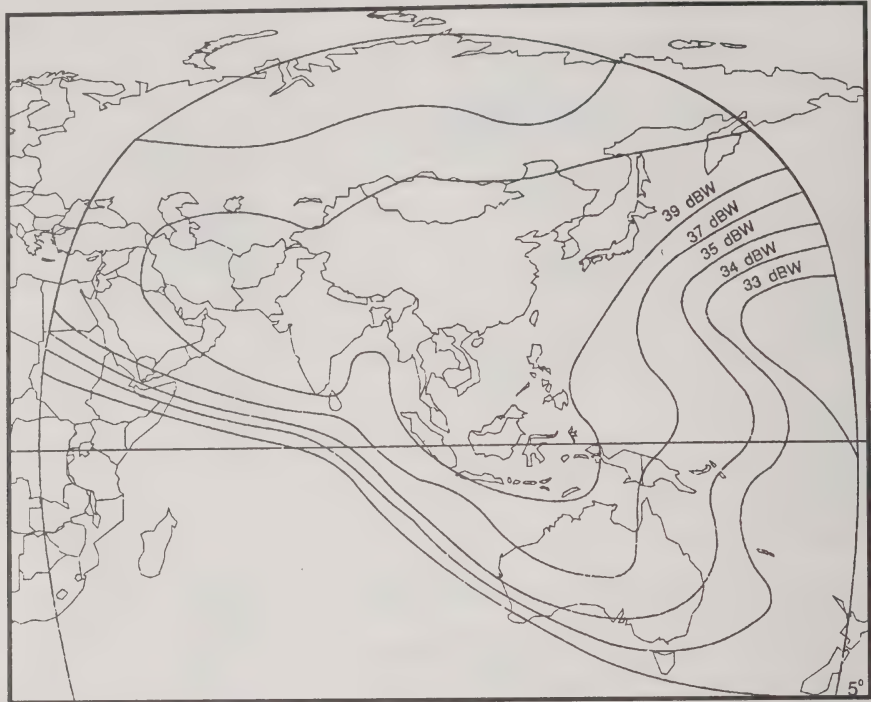
Communications Payload

Frequency Bands:	Receive: 5.845~6.425 GHz Transmit: 3.620~4.200 GHz
Channels/Bandwidth:	C-band: 20 with 36 MHz bandwidth 4 with 72 MHz bandwidth Ku-band: 9 with a 54 MHz bandwidth
C-band Antenna Coverage:	China, Japan, Indonesia, India, the Middle East, and the C.I.S.
Ku-band Antenna Coverage:	Hong Kong, China, Taiwan, Korea
Signal Power (EIRP):	C-band: 42 dBW at beam center Ku-band: 53 dBW at beam center
TWTA Power:	C-band: 55 watts Ku-band: 115 watts
SFD:	C-band: -97 $\pm$ 1 dBW/m ² Ku-band: -97 $\pm$ 1 dBW/m ²
Receiver G/T:	C-band: 0 dB/K maximum Ku-band: 6 dB/K maximum

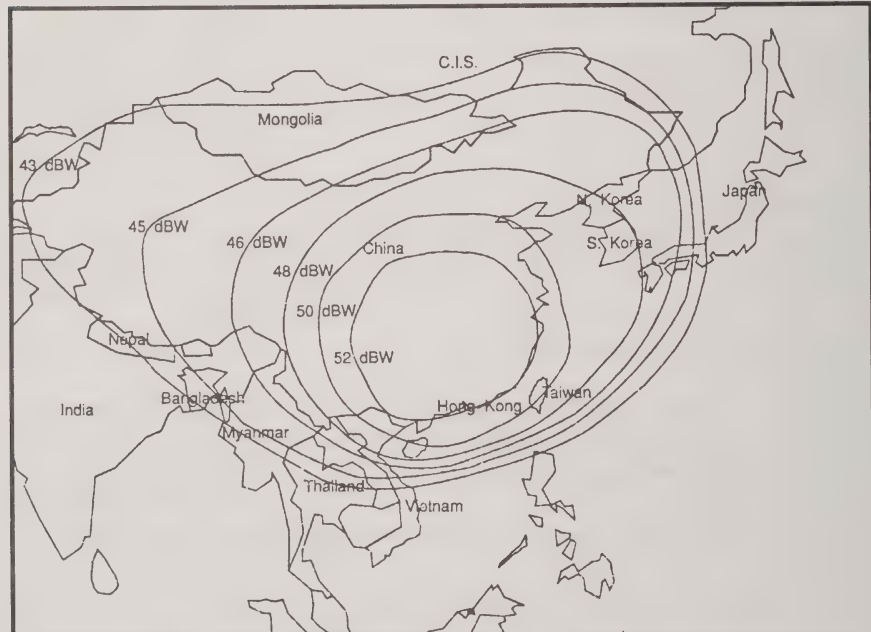
Spacecraft

Satellite Type:	Martin Marietta Astro - Space Series 7000 Three-axis stabilized
Mass At Launch:	3460 kg
Electrical Power:	1022 Watts at end of life
Command Frequencies:	6.4235 GHz Vertical
Telemetry Beacons:	4.1975, 4.1995 GHz Horizontal
Tracking Beacons:	12.503 GHz Vertical 12.504 GHz Horizontal

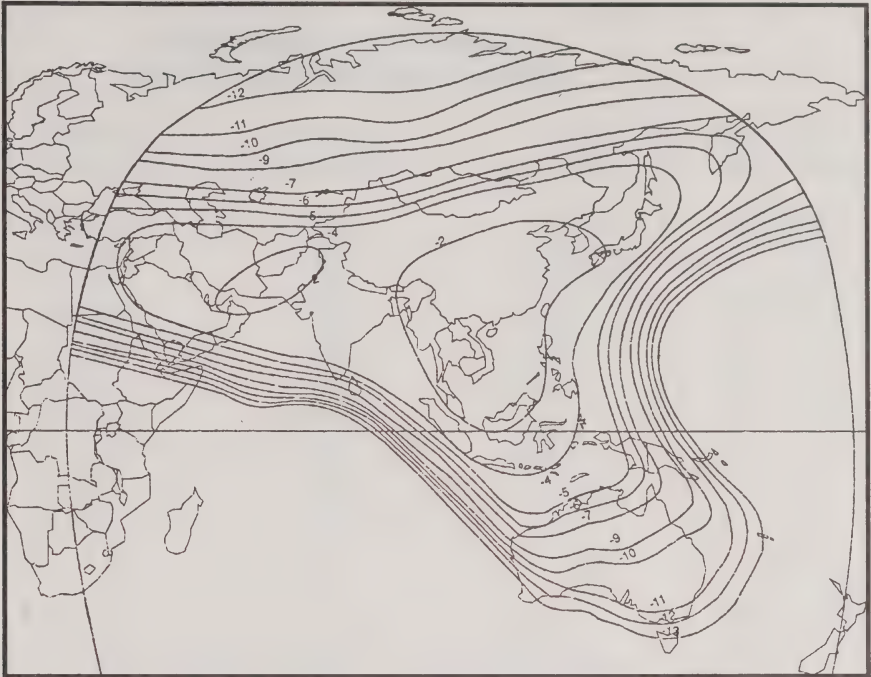
Asiasat 2 C-band EIRP Coverage from 100.5 degrees East (Preliminary)



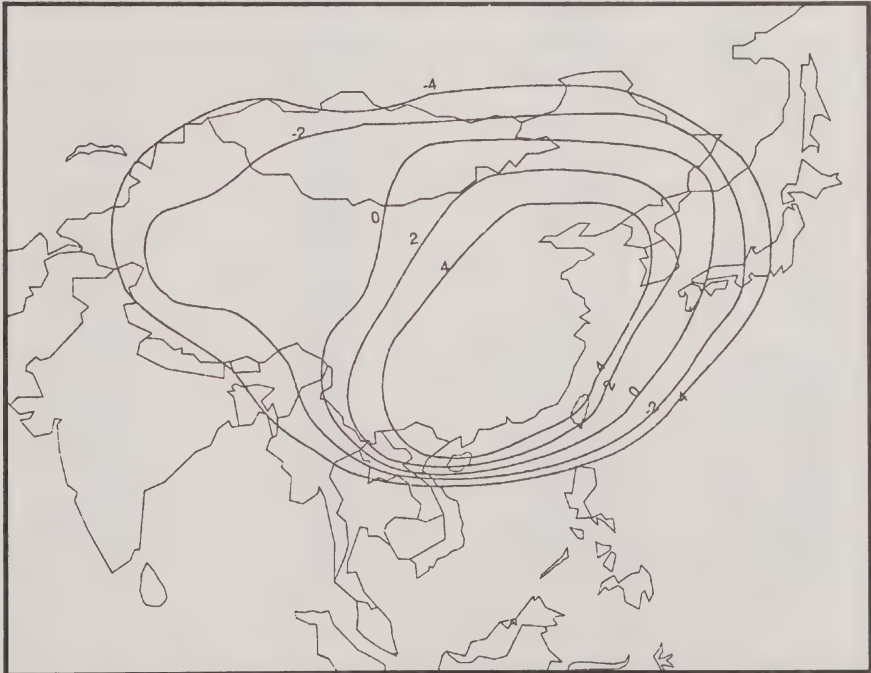
Asiasat 2 Ku-band EIRP Coverage from 100.5 degrees East (Preliminary)



Asiasat 2 C-band Uplink (G/T) Coverage from 100.5 degrees East (Preliminary)



Asiasat 2 Ku-band Uplink (G/T) Coverage from 100.5 degrees East (Preliminary)



**Asiasat 2 100.5° East - C-Band
Satellite Power In Footprint Countries**

Country	City	Azimuth (degree) 100.5° E	Elevation (degree) 100.5° E	EIRP dBW(dB/K)	G/T
Afghanistan	Kabul	133.1	37.4	39	-5
Australia	Sydney	114.36	23.8	35	-11
Bahrain	Bahrain	110.7	28.1	39	-3.5
Bangladesh	Dhaka	156.3	60.1	39	-3
Bhutan	Thimphu	157.6	55.7	39	-3
Brunei	Bandar Seri B.	252.4	72.7	39	-3
Cambodia	Phnom Penh	201.0	75.5	39	-3
China	Beijing	203.3	41.0	39	-4
	Guangzhou	209.8	59.4	39	-2
	Kunming	184.7	60.6	39	-3
	Chengdu	187.1	54.5	39	-3
	Shanghai	216.3	47.3	39	-3
Cyprus	Nicosia	103.6	9.9	37	-6
Egypt	Cairo	100.6	9.1	37	-5
Hong Kong	Hong Kong	212.6	59.5	39	-2
India	Bangalore	118.8	59.1	39	-4
	Hyderabad	127.3	58.7	39	-4
	Bombay	126.9	55.9	39	-3
	Calcutta	150.5	60.3	39	-3
	Madras	121.4	61.9	39	-4
Indonesia	New Delhi	138.2	48.4	39	-4
	Jakarta	315.3	79.6	39	-6
	Medan	147.9	85.3	39	-3
Iran	Tehran	116.5	24.6	39	-5
Iraq	Baghdad	110.0	20.6	38	-5
Israel	Tel Aviv	103.3	11.6	38	-5
Japan	Tokyo	234.4	31.6	39	-3
Korea	Seoul	219.6	38.9	39	-3
Kuwait	Kuwait	110.7	24.6	39	-4
Laos	Vientiane	186.8	68.8	39	-4
Malaysia	Kuala Lumpur	196.5	86.2	39	-3
Mongolia	Ulaanbaator	188.8	35.0	38	-8
Myanmar	Yangon	164.8	70.0	39	-3
N. Korea	Pyongyang	219.1	37.5	39	-3
Nepal	Kathmandu	147.5	51.6	39	-3
Oman	Muscat	110.3	36.7	39	-3
Pakistan	Islamabad	135.9	42.0	39	-5
Philippines	Manila	235.3	60.5	39	-3

**Asiasat 2 100.5° East - C-Band
Satellite Power In Footprint Countries**

Country	City	Azimuth (degree) 100.5° E	Elevation (degree) 100.5° E	EIRP dBW	G/T (dB/K)
Russia (CIS)	Moscow	112.7	16.2	37	-8
	Vladivostok	221.7	31.2	39	-4
Saudi Arabia	Riyadh	106.6	24.4	39	-4
Singapore	Singapore	255.3	85.4	39	-3
Syria	Damascus	104.9	12.8	38	-5
Taiwan	Taipei	223.0	52.2	39	-3
Thailand	Bangkok	180.0	73.5	39	-2
Turkey	Ankara	104.4	8.2	38	-6
United Arab Em.	Abu Dhabi	111.4	31.8	39	-4
Vietnam	Hanoi	193.7	64.7	39	-2
	Ho Chi Minh City	209.7	75.9	39	-2

**Asiasat 2 100.5° East - Ku-Band
Satellite Power In Footprint Countries**

Country	City	Azimuth (degree) 100.5° E	Elevation (degree) 100.5° E	EIRP dBW	G/T (dB/K)
China	Beijing	203.95	40.99	50	3.0
	Chengdu	186.83	54.02	50.0	3.0
	Fuzhou	215.86	51.18	52.0	5.5
	Guangzhou	210.07	59.34	52.0	5.5
	Guiyang	193.64	58.16	52.0	5.5
	Haikou	206.68	63.91	50.0	3.0
	Harbin	214.46	31.29	46.0	-1.0
	Hengyang	205.35	55.81	52.0	5.5
	Lanzhou	185.42	47.96	46.0	0.0
	Lhasa	161.71	53.89	43.5	-3.5
	Shanghai	216.76	47.11	52.0	5.0
	Urumqi	161.69	37.85	44.0	-4.0
	Wuhan	205.50	50.87	52.0	5.5
Hong Kong	Hong Kong	212.72	59.63	52.0	5.0
Korea (South)	Seoul	127.00	37.00	49.0	2.0
Taiwan	Taipei	222.14	52.42	50.5	3.5

The APSTAR Regional Satellite System

APT Satellite Company, Ltd.

Room 1002, 10/F, Conic Investment Building
13 Hok Yuen St.
Hungghom, Kowloon
Hong Kong
Mr. He Ke Rang, President
Mr. Bao Miao Qin, Chief Engineer
Tel: (852) 356-3290
Fax: (852) 773-1050

In April of 1992, Asia Pacific Telecommunications (APT) Satellite Company, Ltd., was registered in Hong Kong as an international company for engaging in communications. The sponsored shareholders include China Telecommunications & Broadcast Satellite Corporation, Hong Kong Chia Tai International Telecommunications Company, Ltd., China Yuan Wang Group Company, and Hong Kong-based Ever-Victory System Company, Ltd.

On May 25, 1992, a contract was signed between Hughes Communications International, Inc., and APT Satellite Company, Ltd., of Hong Kong, for the provision of two spacecraft which will provide satellite communications services on behalf of the company's customers in North and Southeast Asia. The contract includes mission support services, a satellite control facility,

***APSTAR Beam Coverage
(Horizontal Transponders)***



Peak EIRP:	36.4 dBW
1st contour:	36.0 dBW
2nd contour:	35.0 dBW
3rd contour:	34.0 dBW
4th contour:	32.0 dBW
5th contour:	30.0 dBW

and training. Apstar is scheduled for launch in 1994.

Apstar 1 (to be located between 131~134 degrees East Longitude) will be based on the Hughes' spin-stabilized HS 376 platform. Apstar 1 will provide twenty-four medium-power C-band transponders, twenty with a bandwidth of 36 MHz and four with a bandwidth of 72 MHz, downlinking within the 3.6 to 4.2 GHz frequency range. The 36-MHz transponders will be most suitable for the transmission of TV signals, while the 72 MHz transponders will be capable of supporting VSAT systems or 120 Mb/s TDMA voice and data communications traffic.

Apstar 1 will have a wide coverage beam that will illuminate all of Bangladesh, China, Japan, Korea, Mongolia, and Southeast Asia with a nominal 34 to 35 dBW of EIRP, and portions of India and the C.I.S. with a nominal EIRP of 30 to 34 dBW. This single broad coverage beam will be favorable to the direct establishment of regional communications services, both for TV broadcasting and domestic voice, and data networks as well. The spacecraft is expected to have a minimum orbital lifetime of ten years.

Apstar 1 is scheduled for a July, 1994, launch. The initial system will include a TTC&M station to be built in the Hong Kong/Macau region.

*APSTAR Beam Coverage
(Vertical Transponders)*



Peak EIRP:	37.3 dBW
1st contour:	36.0 dBW
2nd contour:	35.0 dBW
3rd contour:	34.0 dBW
4th contour:	32.0 dBW
5th contour:	30.0 dBW

*Apstar 1 At A Glance***Operational History**

Future Orbital Assignment:	Between 131~134 degrees East
Launch Date:	June, 1994
Launch Vehicle:	Chinese Long March II
Status:	Under construction
Design Life:	Ten years

Communications Payload

Frequency Bands:	Receive: 5.845~6.425 GHz Transmit: 3.620~4.200 GHz
Channels:	12 with Horizontal & 12 with Vertical Polarization
Channel Bandwidth:	36 MHz for 20 transponders 72 MHz for 4 transponders
Antenna Coverage:	North and Southeast Asia
Signal Power (EIRP):	35 dBW within service area
TWTA Power:	16 watts
G/T:	More than - 4 dB/K at beam edge
SFD:	-78.0~-88.0 dBW/m2 at beam edge
Redundancy:	30 for 24 (power amplifiers) 4 for 2 (receivers)
Capacity:	

Spacecraft

Satellite Type:	Hughes HS-376 spin-stabilized
Mass:	1383 kg
Electrical Power:	1022 Watts at end of life
Telemetry Beacon:	4.199375 or 4.199575 GHz
Command:	6.422 GHz (Uplink) 5.928 GHz (Transfer orbit)

Apstar 1 EIRP & G/T
At Major Cities

City	EIRP (dBW)	G/T (dB/K)
Guangzhou	35.8	-3.2
Wu Han	35.9	-3.1
Lan Zhou	35.6	-2.8
Kun Ming	35.8	-1.1
Beijing	36.1	-2.8
Har Bing	35.3	-2.8
Taipei	36.5	-2.5
Hong Kong	36.0	-3.3
Shanghai	36.9	-3.1
Yangon	35.5	-2.0
Bangkok	36.1	-2.4
Singapore	35.1	-1.6
Manila	35.9	-1.6
Jakarta	33.9	-1.6
Seoul	36.4	-3.4
Ulaanbaator	34.3	-2.2
Urumqi	34.5	-3.1

Apstar 1 Transponder
Frequency Plan

Tr.#	BW	Pol	Uplink Freq.	Pol	Downlink Freq.
1A	72	V	5.885 GHz	H	3.660 GHz
1B	72	H	5.885 GHz	V	3.660 GHz
2A	72	V	5.965 GHz	H	3.740 GHz
2B	72	H	5.985 GHz	V	3.760 GHz
3A	36	V	6.025 GHz	H	3.800 GHz
3B	36	H	6.045 GHz	V	3.820 GHz
4A	36	V	6.065 GHz	H	3.840 GHz
4B	36	H	6.085 GHz	V	3.860 GHz
5A	36	V	6.105 GHz	H	3.880 GHz
5B	36	H	6.125 GHz	V	3.900 GHz
6A	36	V	6.145 GHz	H	3.920 GHz
6B	36	H	6.165 GHz	V	3.940 GHz
7A	36	V	6.185 GHz	H	3.960 GHz
7B	36	H	6.205 GHz	V	3.980 GHz
8A	36	V	6.225 GHz	H	4.000 GHz
8B	36	H	6.245 GHz	V	4.020 GHz
9A	36	V	6.265 GHz	H	4.040 GHz
9B	36	H	6.285 GHz	V	4.060 GHz
10A	36	V	6.305 GHz	H	4.080 GHz
10B	36	H	6.325 GHz	V	4.100 GHz
11A	36	V	6.345 GHz	H	4.120 GHz
11B	36	H	6.365 GHz	V	4.140 GHz
12A	36	V	6.385 GHz	H	4.160 GHz
12B	36	H	6.405 GHz	V	4.180 GHz

Hughes To Build Apstar 2 Satellite

On November 22, 1993, APT Satellite Co., Ltd., of Hong Kong, signed a contract with Hughes Aircraft Company to build a state-of-the-art Hughes HS-601 three-axis stabilized satellite to be called Apstar 2. The aggressive schedule calls for launch in December of 1994.

The new satellite will be used primarily for television broadcasting. It will have twenty-six C-band transponders with 52-watt power amplifiers and six Ku-band transponders with 50-watt amplifiers. The satellite will be designed to provide an operational lifetime of fifteen years.

Apstar 2 will be significantly larger and more powerful than Apstar 1—an HS-376 spin-stabilized spacecraft also being built by Hughes. While Apstar 1 will cover Mainland China, Hong Kong, Indonesia, Japan, Singapore and Vietnam, Apstar 2 will have an even greater coverage area, extending into Europe, Russia and India, for service to an estimated two-thirds of the world's population.

Asian Alliance Members Acquire Apstar 2 Transponders

In December of 1993, Australia Television International, CNN International, ESPN International, TVB International, Discover Communications, Viacom Networks, and Time Warner announced that they had agreed to lease sixteen transponders on the Apstar 2 satellite. All of these services currently have berths on Indonesia's Palapa B2P satellite. The transponder agreement is in addition to the dozen transponders previously acquired by "Alliance" members on the Apstar 1 satellite scheduled for launch in mid-1994.

The move to Apstar 1 and Apstar 2 will give the new Alliance wider distribution in the region via a more powerful satellite and allow the group to market their programming package to Asian home satellite dishes by means of a common encryption standard as well as joint sales and marketing strategies.

Chapter Five:

The Palapa Satellite System

P.T. Telekomunikasi Indonesia

Jalan Sparman Kav 12
Wisma Bisnis 7th Floor
Jakarta 11410
Indonesia

Mr. Sahala Silalahi, Executive General Manager, Satellite Systems
Tel: (62) 21-530-7500
Fax: (62) 21-566-6330

P.T. Pasifik Satelit Nusantara

Chase Plaza, 17th Floor
Jalan Jendral Sudirman Kov. 21
Jakarta, Indonesia

Mr. Adi R. Adiwoso, Director
Tel: (62) 21-520-8114
Fax: (62) 21-520-8359

The Palapa B Satellite System

The Palapa B satellite system is operated by P.T. Telekomunikasi Indonesia—Indonesia's state-owned telecommunications company. Indonesia inaugurated its first domestic satellite system in July of 1976 with the launch of the first of two Hughes-built Palapa A series satellites. Palapa A1 and A2 have since been retired.

Palapa B1, the first of P. T. Telekom's second generation of communications satellites built by Hughes Aircraft Company, was launched in 1983. In 1992, the satellite was retired from domestic service for Indonesia and relocated to a new orbital assignment over the Pacific Ocean, where it currently is operated in an inclined orbit mode. Renamed Palapa Pacific, the satellite provides telecommunications services to Pacific Rim countries (see separate section at the end of this chapter).

Three Palapa B series satellites currently comprise Indonesia's domestic satellite system: Palapa B2P, launched on March 20, 1987, to an orbital assignment of 113 degrees East Longitude; Palapa B2R, launched on April 13, 1990, to an orbital assignment of 108 degrees East Longitude; and Palapa B4, launched on May 14, 1992, to an orbital assignment of 118 degrees East Longitude. All three satellites were launched from Cape Canaveral, Florida, aboard McDonnell Douglas Delta rockets.

Palapa B series satellites downlink within the 3.7 to 4.2 GHz range. Each satellite uses 10 watt TWTAs to produce a nominal EIRP of 34 dBW within Indonesia. ASEAN member states and Papua New Guinea obtain EIRP levels ranging from 32 to 34 dBW. The capacity of the satellite is 12,000 two-way voice channels or twenty-four color TV signals.

A master control station in Cibinong, near Jakarta, functions as the control center of the Palapa B system. It tracks and sends commands to the satellites and controls user traffic. Ground stations in Bandung and Cilacap also serve important roles in the Palapa satellite network.

Palapa Television Traffic

The Palapa B satellites transmit Indonesia's national TV services from Jakarta to more than 150 million people living within the 3,400-mile-long archipelago of 13,677 islands which comprise the nation of Indonesia. Palapa B2P also provides regional telecommunications services for neighboring countries such as the Philippines, Thailand, Malaysia, and Papua New Guinea, including the full-time transmission of many of their national TV networks. Moreover, Palapa B2P also provides several channels of international TV for broadcasters, cable systems, and MMDS operators within the region, including HBO Asia, ESPN International, CNN International, Australia Television International (ATVI), The Gold Network (Australia), CFI International (France), and TV New Zealand.

BrightStar and Reuters TV also periodically use Palapa B satellites to relay news and sports feeds. The six ASEAN nations of Indonesia, Malaysia, Philippines, Singapore, Thailand, and Brunei Darussalam use Palapa B2P to transmit a TV news exchange service between centers in each of the ASEAN countries. Communications and Satellite Services (CSS) in Kuala Lumpur uses Palapa B to relay B-MAC encrypted video feeds from horse tracks in Malaysia and Hong Kong to private clubs in Malaysia.

Palapa Telecommunication Traffic

Palapa B series satellites support voice and data traffic on behalf of the following customers within the region: Citra Sari Makmur (CSM), Indosiar, Linas Arta, Dwi Mitra Aero Lintas Wisata, and P.T. Telekom (Indonesia); Acumen, PRD (Public Relations Department), PTD, Samart Telecom, SCHQ (Supreme Command Headquarters), Skycom, and the Telephone Authority of Thailand (Thailand); Telekom Malaysia (Malaysia); CRSC, Domsatphil, ICC, LBNI, and PLTD (Philippines), UNTAC (Cambodia), GCAA (Vietnam), and OTC (Australia). Thai traffic is scheduled to migrate to the Thaicom satellite system when existing Thai contracts with PT Telekom expire.

Although the complete description of all these services goes beyond the confines of this publication, the following two examples provide further details on a few of the various applications being undertaken by Palapa B satellites. In 1988, Scientific-Atlanta, Inc., signed a contract valued at US\$ 17.5 million to enhance Indonesia's national voice communications capa-

bilities. Earth station equipment for twenty-six sites was supplied under the contract, including sixteen major new earth station terminals. Financing for the equipment was provided by the United States Export-Import Bank.

Fully-redundant Time Division Multiple Access (TDMA) terminals were provided for each of the sites. A Demand Assigned Multiple Access (DAMA) capability also was included. DAMA is a telephone switching system in which a pool of voice channels is allocated on demand rather than on a preassigned basis. The satellite-based TDMA system provides for cost-effective, efficient handling of voice, video, and data transmissions.

Scientific-Atlanta, Inc., and Citra Sari Makmur (CSM), an Indonesian firm, have installed a VSAT network that provides interactive data, video, and voice communications to 4,000 sites in Indonesia. The SKYLINX.25 turnkey network included master earth stations and remote site terminals. Scientific-Atlanta's SKYLINX.25 architecture is based on the CCIT X.25 recommendation for digital communications. Remote site equipment included digital satellite modem and 1.8m VSAT antennas. Network control software was provided in the system's packet-switch.

Samart Telecom Co., Ltd., of Bangkok, Thailand, operates a VSAT network via the Palapa system using equipment installed and manufactured by Scientific-Atlanta, Inc., of Atlanta, Georgia. The system consists of a 10m master hub earth station, three 6m mini-hubs, and more than 400 remote terminals throughout Thailand.

The VSAT network uses small, low-cost satellite terminals to support telephone and data communications throughout the Southeast Asian nation. Scientific-Atlanta's Skylinx.25 and Skylinx.MCPC (Multiple Channel Per Carrier) VSAT systems have been installed at the remote sites.

The network supports data transmission requirements of banks as a primary application. This is driven in part by the recent increase in the use of automated teller machines in Thailand.

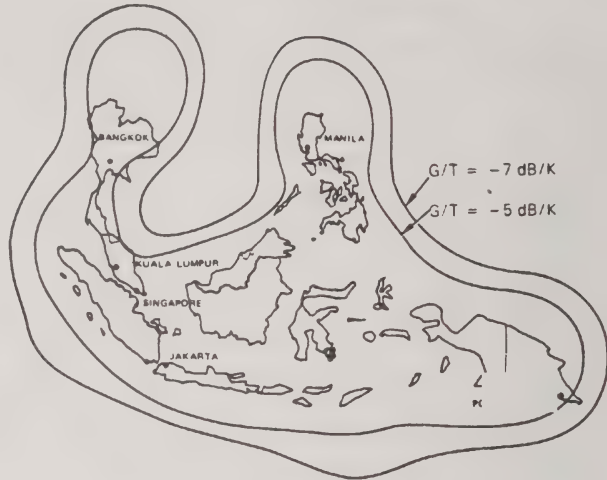
In addition to data communications, some sites in the network also support digitally-compressed voice traffic. Scientific-Atlanta's digital voice unit provides high-quality, 16 kb/s voice and Group 3 facsimile capability.

At the heart of the system is Scientific-Atlanta's Model 7890/95 transceiver, which consists of compact indoor and outdoor units. The Model 7890/95 can transmit and receive on either single or multiple satellite carriers. This system provides data transmission at more flexible rates and is more satellite-efficient than previously available systems. The transceiver system's L-band functionality permits a wide range of services, including telephony, facsimile, interactive and broadcast data services, and television reception—integrated into a single earth station terminal. The transceiver also will work in single or multi-transponder systems.

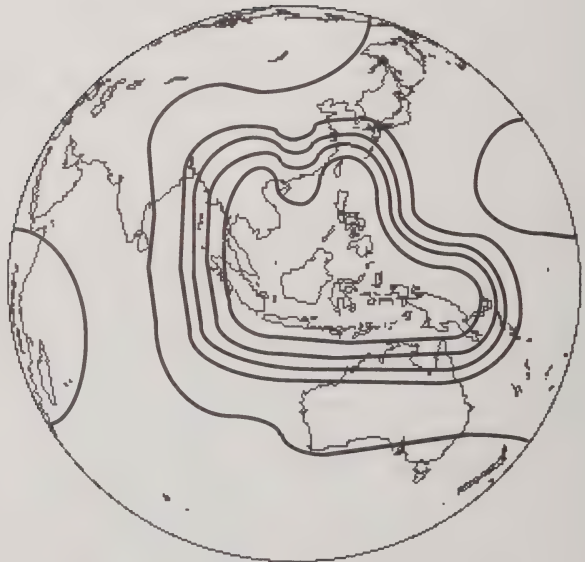
ComStream Corp., has supplied Samart Telecom with hardware for a data broadcast hub, satellite modems, and more than 200 receive-only earth stations (R/O VSATs) to interconnect the forty firms that comprise the Association of Members of Thailand's Stock Exchange.

The ComStream DBR401 broadcast receivers are part of the one-way portion of the network—Broadcast Service (BS) and Price Reporting System (PRS). BS transmits basic trading information such as orders, transactions, and confirmation of trades from SET to all forty brokerage firms. PRS sends

*Typical Palapa B Receive
G/T Coverage*



*Palapa Transmit
Coverage from 113
degrees East Longitude*



EIRP at	
Beam Center:	36 dBW
1st contour:	34 dBW
2nd contour:	32 dBW
3rd contour:	30 dBW
4th contour:	26 dBW
5th contour:	16 dBW

trading information from SET to brokers' head offices and to investors.

At each of the brokerage firms, a ComStream broadcast receiver demodulates and demultiplexes the aggregate data stream into multiple real-time services for presentation to the brokers' terminals. The broadcast service operates at 64 kb/s. The remote antennas are 3.8 meters in diameter.

ComStream modems have been integrated as part of the SAMART STOCKLINK System. SAMART STOCKLINK is a service that provides two-way communication between brokers' head offices and their nationwide branches.

Palapa B2P, B2R, and B4 at a Glance

Operational History

Launch Date:	Palapa B2P - March 20, 1987 Palapa B2R - April 13, 1990 Palapa B4 - May 14, 1992
Launch Vehicle:	McDonnell Douglas Delta rockets
Orbital Assignment:	B2P - 113 degrees East B2R - 108 degrees East B4 - 118 degrees East

Communications Payload

Frequency Band(s):	Receive: 5.925~6.425 GHz Transmit: 3.700~4.200 GHz
Channels:	24
Channel Bandwidth:	36 MHz
Channel Polarization:	Horizontal/Vertical Polarization
Antenna Coverage:	ASEAN countries
Signal Power (in EIRP):	36 dBW nominal
TWTA Power:	10 watts
Capacity:	24,000 one-way voice circuits or 24 color TV channels

Spacecraft

Satellite Type:	Hughes HS 376 spin-stabilized
Mass In Orbit:	1,433 lb (650kg)
Maximum (deployed) Dimensions:	22 feet, 5 inches (6.8m) in height 7 feet, 1 inch (2.2m) in diameter
Electrical Power:	1,062 watts at beginning of life
Design Life:	8 years, 2 months
Telemetry Beacons:	4.197 GHz

The Palapa C Satellite System

In 1995, Indonesia will begin replacing its existing Palapa B satellites with a new third generation satellite system known as Palapa C. The first satellite is scheduled to be launched in June of 1995 to replace Palapa B2P.

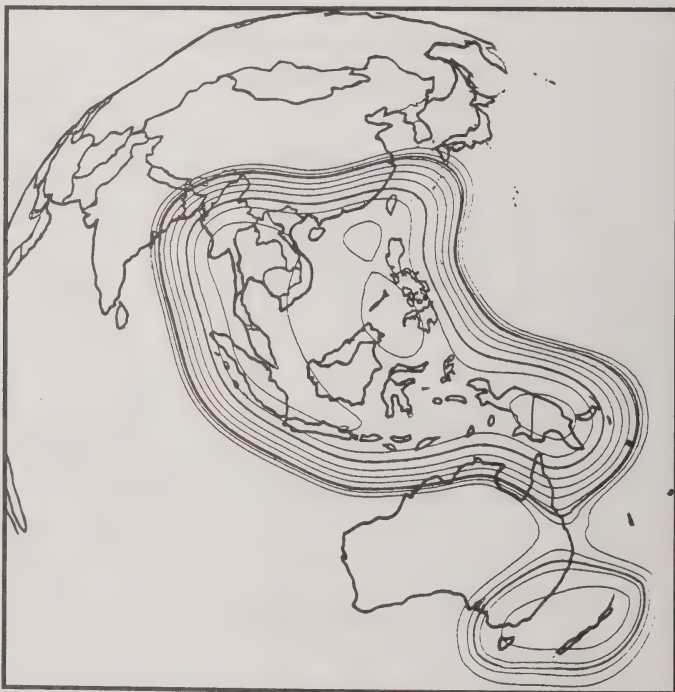
Facing increasing competition from several other international and regional systems, Indonesia has decided to significantly increase the power output and range of the primary C-band beam for Palapa C to significantly improve coverage in Eastern Australia, Cambodia, Hong Kong, Macau, Myanmar, New Zealand, and Vietnam. This beam will be connected to a total of twenty-four transponders, each with a bandwidth of 36 MHz.

An extended C-band beam also will provide coverage into Bangladesh, areas of China, India, Japan, Korea, Siberia (Russia), Sri Lanka, and Taiwan. The extended beam will be connected to a total of six transponders, each with a bandwidth of 36 MHz.

For the first time, Palapa satellites also will be equipped with Ku-band capacity. The Palapa C Ku-band beam will cover Guam, Hong Kong, Japan, Macau, Singapore, Malaysia, Taiwan, and Thailand. The Ku-band beam will be connected to a total of four transponders, each with a bandwidth of 72 MHz.

Palapa C1 C-band
Standard Coverage

EIRP (Beam Center):	40 dBW
1st contour:	39 dBW
2nd contour:	38 dBW
3rd contour:	37 dBW
4th contour:	36 dBW
5th contour:	35 dBW
6th contour:	34 dBW
7th contour:	33 dBW
8th contour:	32 dBW
9th contour:	31 dBW



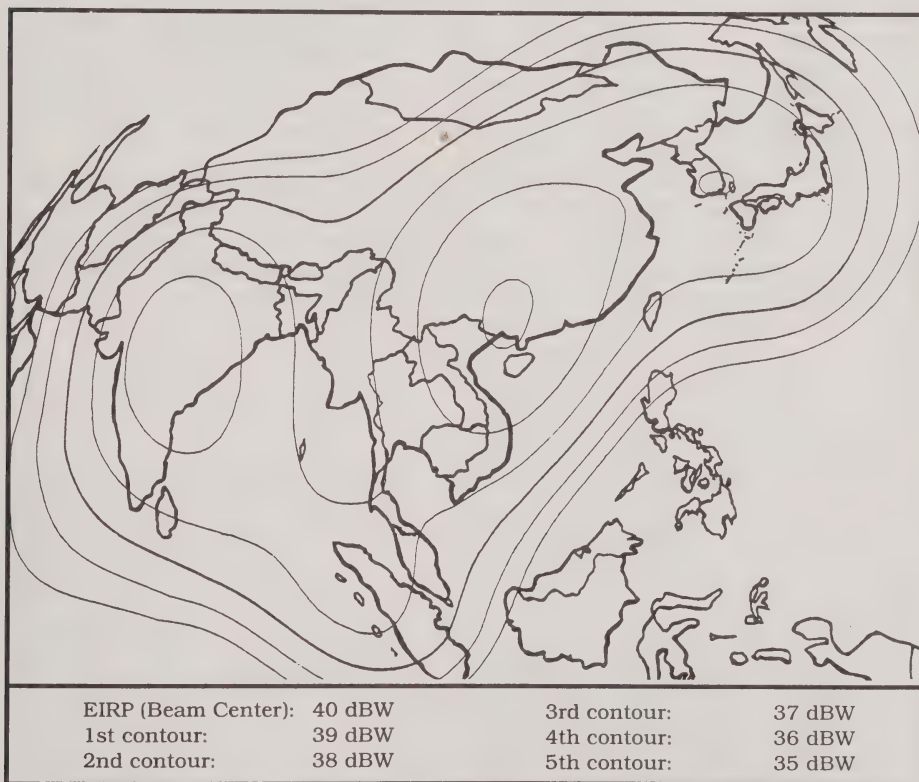
Hughes to Build Palapa C Satellites for Indonesia

Hughes Aircraft Company has signed an agreement to build two Palapa C communications satellites for Indonesia. The multimillion-dollar contract is between Hughes Communications International, Inc., of Los Angeles—a Hughes Aircraft subsidiary—and PT SATELINDO, a newly formed, private telecommunications company in Indonesia. Financial details were not disclosed. The agreement calls for two HS 601 model body-stabilized satellites, plus an option for a third spacecraft. Hughes also will upgrade the master control station in Daan Mogot, outside Jakarta. The Palapa-C satellites are scheduled for delivery in July, 1995, and January, 1996, respectively. SATELINDO has until 1999 to exercise its option for the third satellite.

Ariane To Launch Palapa C1 Satellite

In 1993, a launch contract for Indonesia's Palapa C1 satellite was signed by Mr. Iwa Sewaka, Chairman of P.T. Satelit Palapa Indonesia (Satelindo), Mr. Adi R. Adiwoyo, Chairman of P.T. Pasifik Satelit Nusantara (BSN) of Indonesia, and Mr. Charles Bigot, Chairman and CEO of Arianespace.

Palapa
C1 Ex-
tended
C-band
Coverage



*Palapa C1 Ku-band
Beam Coverage*

EIRP (Beam Center):	50 dBW
1st contour:	49 dBW
2nd contour:	48 dBW
3rd contour:	47 dBW
4th contour:	46 dBW
5th contour:	45 dBW

Guam Spot	
1st contour:	48 dBW
2nd contour:	47 dBW
3rd contour:	46 dBW
4th contour:	45 dBW



Palapa C1 will be launched in 1995 by an Ariane launch vehicle from the Kourou Space Center in French Guiana. Weighing 2,989 kilograms at launch, Palapa C1 will offer thirty C-band channels and four Ku-band channels, to provide both telephone and television transmission services. Design life in geostationary orbit is fourteen years.

Palapa C at a Glance

Operational History

Launch Date:	Palapa C1 - 1995 Palapa C2 - 1996
Launch Vehicle:	Ariane 4
Orbital Assignment:	C1 - 113 degrees East C2 - 108 degrees East
Mission Lifetime:	14 years

Communications Payload

Frequency Band(s):	Receive: 5.925~6.425 GHz Transmit: 3.700~4.200 GHz Receive: 6.425~6.665 GHz Transmit: 3.400~3.680 GHz Receive: 13.250~14.000 GHz Transmit: 10.950~11.700 GHz
C-band Channels:	30
C-band Channel Bandwidth:	36 MHz
Ku-band Channels	4
Ku-band Channel Bandwidth:	72 MHz
Channel Polarization:	Horizontal/Vertical Polarization
Standard C-band Coverage:	Indonesia, Malaysia, Thailand, Philippines, Singapore, Cambodia, Vietnam, Macau, Taiwan, Hong Kong, New Zealand, and Eastern Australia.
Extended C-band Coverage:	Thailand, Malaysia, Taiwan, Myanmar, Sri Lanka, Bangladesh, India, Korea, Japan, and Eastern China.
Ku-band Coverage:	Japan, Korea, Hong Kong, Taiwan, Malaysia, Thailand, Singapore, Macau, and Guam.
C-band Signal Power (in EIRP):	37 dBW nominal EIRP
C-band G/T:	-2.5 dB/K
Ku-band Signal Power:	50 dBW peak EIRP
Ku-band G/T:	+4.0 dB/K

EXTENDED
C

Spacecraft

Satellite Type:	Hughes HS 601 three-axis stabilized
Mass In Orbit:	2,989 kilograms

Palapa Pacific

In 1991, Pasifik Satelit Nusantara (PSN) of Jakarta, Indonesia, purchased the Palapa B1 satellite from P.T. Telekom. The satellite subsequently was relocated to 134 degrees East Longitude to provide telecommunications services to various Pacific Rim countries. Operational service in an inclined orbit mode began in early 1992. PT. Telekom, a majority shareholder in Pasifik Satellite, continues to operate the satellite.

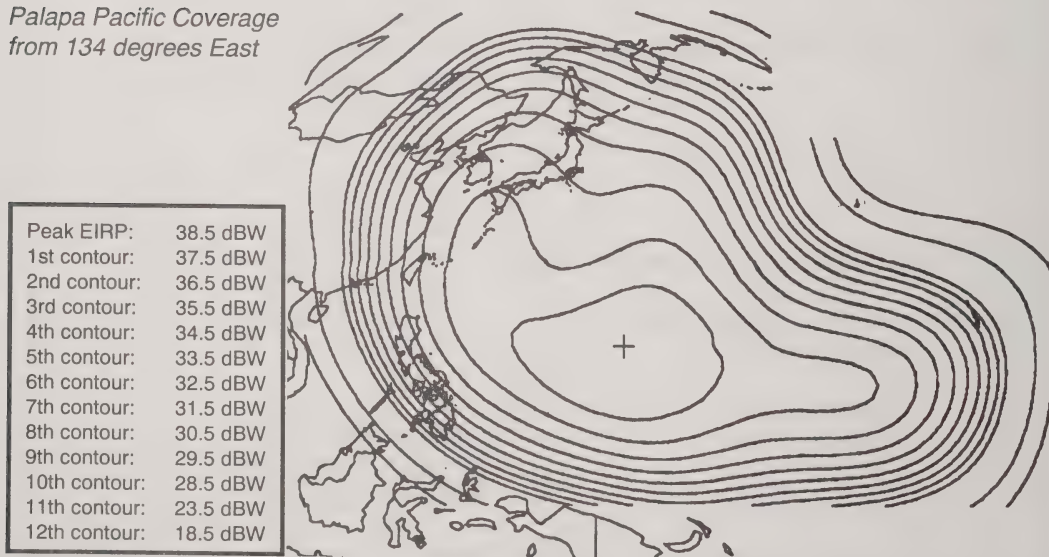
Continuity for the Palapa Pacific system will be provided by existing Palapa satellites, either from the Palapa B series once they have been retired from domestic service, and/or from the next generation Palapa C satellites scheduled for launch in 1995 and 1996. PSN intends to purchase the remaining four satellites of the Indonesian Palapa B series.

Services offered using the Palapa Pacific System include:

- TV Broadcast/Distribution to small TVROs (analog and digital)
- TV satellite news gathering (analog and digital)
- Private Voice/Data/Video VSAT networks
- Low-cost rural telecommunications
- Region-wide information database systems
- Region-wide data collection systems
- National and International PSTN links
- Long and medium-haul high-capacity cable restoration

Palapa Pacific's single beam design allows straightforward interconnectivity between any location within the coverage beam. This permits not only domestic applications for individual countries, but also full international links, networks, and services.

*Palapa Pacific Coverage
from 134 degrees East*



Chapter Six:

The ARABSAT Regional Satellite System

ARABSAT

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Riyadh, 11431 Saudi Arabia

Tel: 966-1-464-6666

Fax: 996-1-465-6983

Arabsat is a regional satellite system created under the auspices of the twenty-one members of the League of Arab States, an international cooperative composed of the following countries and entities: Algeria, Bahrain, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, the Palestine Liberation Organization (PLO), Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, the United Arab Emirates and Yemen. In 1976, the Arab League formed the Arabian Satellite Communications Organization (Arabsat) to supervise the construction, launch, and operation of the Pan-Arabian satellite system.

In 1981, Arabsat chose Aérospatiale as the prime contractor for the development and production of its first generation satellites, with U.S. corporations Ford Aerospace (today known as Space Systems/Loral) and McDonnell Douglas also providing substantial assistance for the project.

The Arabsat 1-A satellite was deployed by Ariane on February 8, 1985, and the Arabsat 1-B satellite was launched from a NASA space shuttle on June 18, 1985. Both of these satellites have since been retired from service.

Arabsat 1-C was launched by Arianespace on February 26, 1992. In 1993, Arabsat purchased an older, in-orbit satellite from Telesat Canada. This satellite is now known as Arabsat 1-D.

On April 17, 1993, Arabsat signed a contract with Aérospatiale for the construction of two next-generation Arabsat II satellites. Arabsat II series satellites will feature an expanded C-band coverage beam, higher C-band transponder power, and a Ku-band satellite communications payload. The first flight model of the Arabsat II series will be ready for launch by Arianespace in 1995.

Arabsat 1-C Technical Parameters

The Arabsat 1-C telecommunications payload operates in both the C- and S-bands. Twenty-five C-band transponders are available from the spacecraft. Each of the two S-band (2.5~2.6 GHz) transponders aboard Arabsat 1-C is powered by two 50 watt TWTAs in parallel. This capacity was designed

to provide a DBS television signal to community earth stations at locations with little or no access to terrestrial television broadcasts. Antennas 12 feet (3.5m) in diameter can be used for reception of S-band transmissions once they have been implemented.

Arabsat 1-C Telecommunications Traffic

Arabsat 1-C telecommunications traffic consists of analog and digital telephony, high-speed data relays, regional TV distribution of news and other programming to members of the Arab States Broadcasting Union (ASBU), regional distribution of program services such as Middle East Broadcasting Center (MBC), CNN International (USA), and Canal Plus International (France), distribution of national TV services for Abu Dhabi, Dubai, Egypt, Jordan, Kuwait, Oman, Mauritania, Morocco, and Saudi Arabia, distribution of the Radio Sudan and Radio Orient radio services, and community TV reception of MBC through the satellite's S-band payload.

Moreover, the Middle East Broadcasting Centre (MBC) intends to launch a package of digitally-compressed subscription channels over Arabsat beginning in 1994. The new channels are: MBC2 - the Movie Channel; MBC3 - the Family, Entertainment and Educational Channel; MBC4 - the General Entertainment Channel; and a News/Sports channel. MBC will be using the DigiCipher digital video compression system developed by General Instrument. MBC will offer its pay TV channels either as a package or individually with a minimum of three channels being sold. MBC 1 will remain a free channel available to all viewers.

Arabsat Analog TV Transmission Parameters

	PAL	SECAM
Signal-to-Noise Ratio:	45.0 dB	
E/S EIRP:	78.6 dBW	
Video Bandwidth:	5.0 MHz	6.0 MHz
IF Bandwidth:	24 MHz	
Energy Dispersal:	0.5 MHz p/p	
Peak Deviation:	5.5 MHz	5.8 MHz
Over-deviation:	2.3 dB	2.7 dB
Differential Gain:	<10 percent	
Differential Phase:	< +/- 4 degrees	
Audio Bandwidth:	10 KHz (CCITT J22)	
De-emphasis:	(CCITT J17)	
Subcarrier Frequency:	6.6 MHz +/- 5 KHz	
Subcarrier Deviation:	30 KHz (with 1.42 KHz test tone)	
Occupied Subcarrier BW:	< 200 KHz	
Subcarrier Deviation:	850 KHz peak deviation	

Arabsat 1-C at a Glance

Operational History

Launch Date(s):	February 26, 1992
Launch Vehicle(s):	Arianespace
Orbital Assignment:	31 degrees East Longitude
Status:	Operational
Design Life:	7 years

Communications Payload

Frequency Band(s):	Receive: 5.925~6.425 GHz Transmit: 3.700~4.200 GHz 2.540~2.655 GHz
Channels:	26: 12 C-band channels with RHCP, 13 C-band channels with LHCP, 1 S-band channel with linear polarization
Channel Bandwidth:	33 MHz
Antenna Coverage:	Arab League nations
Signal Power (EIRP):	C-band: 31 dBW nominal S-band: 41 dBW at beam edge
TWTA Power:	C-band: 8.5 watts S-band: Two 50-watt tubes in parallel
Capacity:	8,000 simultaneous telephone circuits and seven TV signals or equivalent traffic in other configurations

Spacecraft

Satellite Type:	Space Systems/Loral (Ford Aerospace) three-axis stabilized
Mass In Orbit:	588 kg (1296.3 lb)
Maximum (deployed)	
Dimensions:	2.26m (7.4 ft) x 1.64m (5.4 ft) x 1.49m (4.9 ft); 20.7m (67.9 ft) from tip to tip with solar arrays deployed
Electrical Power:	1,300 watts at end of life
Telemetry Beacons:	3.700~3.705 GHz 4.199 GHz

*Arabsat C-band Coverage
from 31 degrees East*



Peak EIRP:	35 dBW
1st contour:	33 dBW
2nd contour:	31 dBW
3rd contour:	29 dBW
4th contour:	27 dBW
5th contour:	17 dBW

*Arabsat S-band Coverage
from 31 degrees East*



1st contour:	41 dBW
2nd contour:	40 dBW
3rd contour:	39 dBW

Arabsat 1-C Transponder Frequency Plan

Tr. Pol. Uplink/Downlink

1A	LP	5943.75/2560.50 MHz
1B	LP	5943.75/2634.50 MHz

2	LHCP	5962.25/3737.25 MHz
3	RHCP	5980.75/3755.75 MHz
4	LHCP	5999.25/3774.25 MHz
5	RHCP	6017.75/3792.75 MHz
6	LHCP	6036.25/3811.25 MHz
7	RHCP	6054.75/3829.75 MHz
8	LHCP	6073.25/3848.25 MHz
9	RHCP	6091.75/3866.75 MHz
10	LHCP	6110.25/3885.25 MHz
11	RHCP	6128.75/3903.75 MHz
12	LHCP	6141.25/3922.25 MHz
13	RHCP	6165.75/3940.75 MHz
14	LHCP	6184.25/3959.25 MHz
15	RHCP	6202.75/3977.75 MHz
16	LHCP	6221.25/3996.25 MHz
17	RHCP	6239.75/4014.75 MHz
18	LHCP	6258.25/4033.25 MHz
19	RHCP	6276.75/4051.75 MHz
20	LHCP	6295.25/4070.25 MHz
21	RHCP	6313.75/4088.75 MHz
22	LHCP	6332.25/4107.25 MHz
23	RHCP	6350.75/4125.75 MHz
24	LHCP	6369.25/4144.25 MHz
25	RHCP	6387.75/4162.75 MHz
26	LHCP	6406.25/4181.25 MHz

LP = Linear polarization

LHCP = Left hand circular polarization

RHCP = Right hand circular polarization

Arabsat 1-D

In 1993, the Arabsat organization signed an agreement with Telesat Canada governing the sale of the Anik D2 C-band communications satellite. Anik D2 initially was designed to serve as part of Canada's domestic satellite system. More recently, however, the satellite was used by GE Americom to replace the ailing Satcom F4R satellite in December of 1991. With the successful launch of its new generation Satcom C3 and C4 satellites in late 1992, GE no longer required the use of Anik D2. Control of the spacecraft

was returned to Telesat Canada on April 1, 1993. Telesat subsequently drifted the satellite to a new orbital assignment at 20 degrees East Longitude. Renamed Arabsat 1-D, the satellite arrived on station in August of 1993. Following a comprehensive technical check-out by Arabsat and Telesat, the satellite was placed into operational service.

Because of low reserves of stationkeeping fuel, Arabsat 1-D was slowly drifted to its new orbital assignment. Moreover, the satellite began operations in an inclined orbit mode from day one at its new assigned position. According to NASA's Satellite Situation Report of September 3, 1993, Arabsat 1-D's orbital inclination at that time was ± 0.45 degrees. The inclination will increase at a rate of approximately ± 0.8 degrees per year. Telesat expects that the satellite will remain functional through the end of 1995—long enough for Arabsat to launch the first of its new generation Arabsat II dual-band (C/Ku-band) spacecraft.

Telesat's contract with Arabsat includes Telesat's supply of Telemetry, Telecommunications, and Command (TT&C) services. While the TT&C facility is physically based in Tunis, Telesat maintains direct control through computer links to Telesat's control center in Toronto, Canada.

Arabsat was forced to take this interim measure because of the premature loss of fuel experienced by its Arabsat 1-A and 1-B satellites which occurred in 1992—even though the use of an inclined orbit was supposed to extend the operational lifetimes of the two satellites by several additional years. By allowing Telesat Canada to maintain control of the spacecraft, Arabsat has ensured that the satellite will be maintained by a knowledgeable technical staff with plenty of experience in flying spin-stabilized spacecraft.

Arabsat 1-D Telecommunications Traffic

Arabsat 1-D provides supplemental capacity for Arabsat 1-C which, at the time of writing, was fully loaded with television and telephony traffic.

In late 1993, a new service uplinked from Tunis, known as Future TV, made its appearance on Arabsat 1-D. The new Arabic-language service offers a wide variety of English-language programming with Arabic subtitles, including regular segments devoted to U.S. mini-series and music videos.

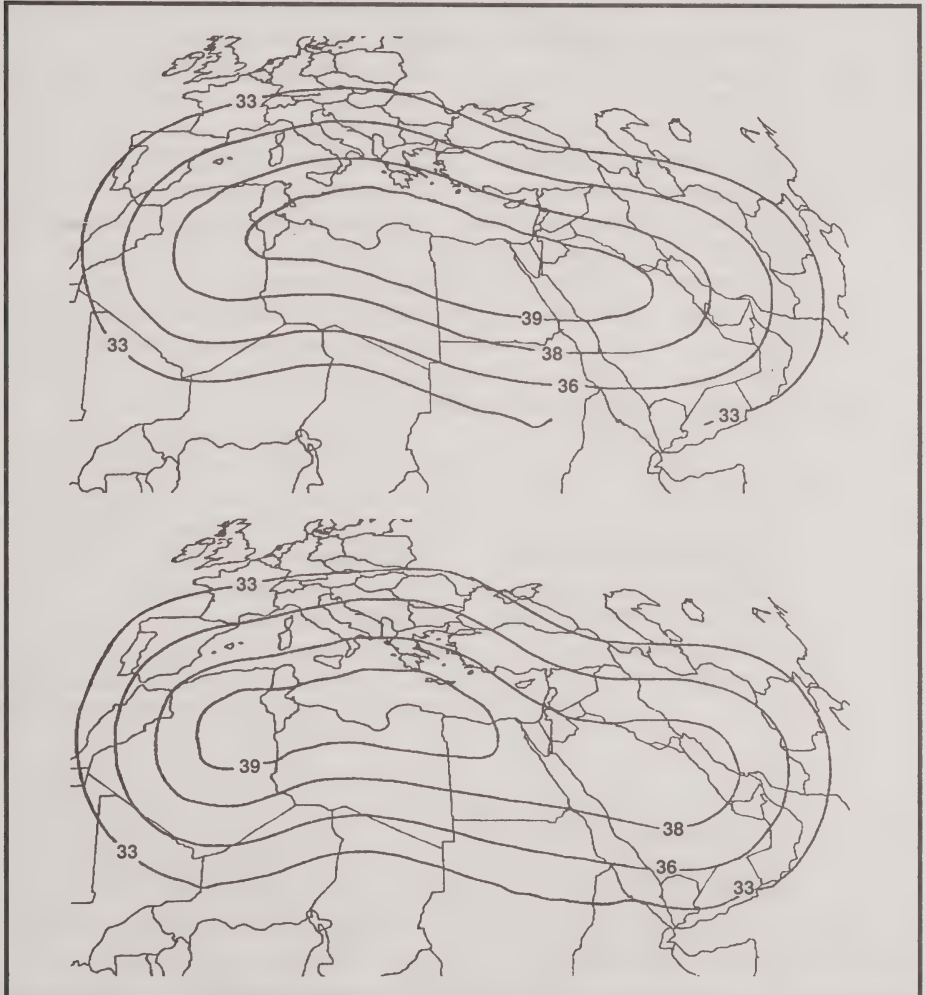
According to reports emanating from the 1993 MIPCOM convention, Rome-based Orbit Satellite Television Network intends to launch a three-channel Arabic-language program package on the Arabsat 1-D satellite in early 1994, with the programming package growing to a total of twenty-one services by the end of the year. A recent news report in *World Broadcasting Magazine* indicated that Orbit Satellite Television Network will use an MPEG 2.0 digital video compression system developed by Scientific-Atlanta. The signals reportedly will be uplinked from Rome, Italy. Also in the wings: another new venture backed by Europlus—a direct-to-home satellite TV programmer currently using the INTELSAT K satellite. Europlus intends to use Arabsat 1-D to launch a four-channel service known as Arab Radio & Television (ART).

A History of Arabsat 1-D

Arabsat 1-D was built for Telesat by Spar Aerospace Ltd., of Toronto, under a CAN\$ 80.8 million contract awarded in 1979. Hughes Aircraft Company also served as the largest subcontractor on the project.

On November 9, 1984, the satellite was launched into a unique, two-year storage orbit located at 111.5 degrees West Longitude. Telesat determined that even though the satellite was not immediately needed, it would be much less expensive to store the satellite in space rather than on Earth because of an anticipated increase in launch costs over the next two years.

Arabsat 1-D Horizontal (top) and Vertical (bottom) transponder coverage beams.



Arabsat 1-D Technical Specifications

Arabsat 1-D is a standard twenty-four transponder C-band satellite based on the immensely successful Hughes HS-376 platform. Each transponder is capable of transmitting 960 one-way analog voice circuits or one conventional TV signal. Powered by 11.5 watt TWTAs, the satellite's single C-band beam has been tilted South to cover Northern Africa and the Middle East with a nominal EIRP of 36 dBW.

The spacecraft bus is a spin-stabilized structure with concentric, cylindrical solar panels that soak up energy from the Sun and provide close to 1,000 watts of electrical power under normal operation. Following relocation, however, Telesat retracted the lower drum, thereby covering a portion of the satellite's solar array. While this limits the number of available transponders to twenty-two, additional station-keeping fuel savings will be realized because of the shift in the bird's center of gravity.

Arabsat 1-D at a Glance

Operational History

Launch Date(s):	November 9, 1984
Launch Vehicle(s):	McDonnell Douglas Delta 3920 rocket
Orbital Assignment:	20 degrees East Longitude
Status:	Operational
Design Life:	10 years (extended through the use of two-year storage orbit).

Communications Payload

Frequency Band(s):	Receive: 5.925~6.425 GHz Transmit: 3.700~4.200 GHz
Channels:	24: 12 with vertical polarization 12 with horizontal polarization
Channel Bandwidth:	36 MHz
Antenna Coverage:	Arab League nations
Signal Power (EIRP):	33 dBW nominal
TWTA Power:	11.5 watts
Capacity:	21,600 one-way telephone circuits or 24 simultaneous color TV signals or equivalent traffic in other configurations

Spacecraft

Satellite Type:	Hughes HS-376 spin-stabilized
Mass In Orbit:	632.8 kg (1395 lb)
Dimensions:	6.6m (12.75ft) x 2.2m (7.08 ft)
Electrical Power:	1,000 watts at end of life

Arabsat II

Arabsat II is the second generation of satellites developed for the Arab Satellite Communications Organization. Aérospatiale Espace Et Defence was selected as prime contractor after an international tender, and signed the contract with Arabsat on April 17, 1993. Two flight models will be built, one of which will be delivered in orbit. The second is a ground spare. The first flight model will take over from the first generation Arabsat 1-C satellite, which also was built by Aérospatiale. As prime contractor, Aérospatiale is responsible for ensuring program management, and integration and testing of the spacecraft at its Cannes France center. Aérospatiale also is responsible for the structure, thermal control and solar arrays. Other team members are DASA (Germany) for the propulsion and attitude control, and Alcatel Espace (France) for the payload. Arianespace (France) is responsible for the launch, and CNES for the orbital positioning maneuvers.

The Arabsat satellites serve the entire region of the twenty-one Arab League countries. The satellites of the second generation have much higher performance than that of the first generation, and will have a lifetime extended to sixteen years. They will provide services of telecommunications and direct television broadcasting by means of twenty-two C-band transponders and twelve Ku-band transponders. For the C-band payload, there will be fourteen transponders (twelve at 36 MHz and two at 54 MHz bandwidth) with 13-watt amplifiers capable of delivering an EIRP of 35 dBW, and eight transponders (36 MHz bandwidth) with 52-watt TWTAs supplying an EIRP of 41 dBW. For the Ku-band payload, there will be twelve high-powered Ku-band transponders (eight at 36 MHz and four at 30 MHz bandwidth) with 90-watt TWTAs producing an EIRP of 47 dBW over the major portion of the satellite's coverage area.

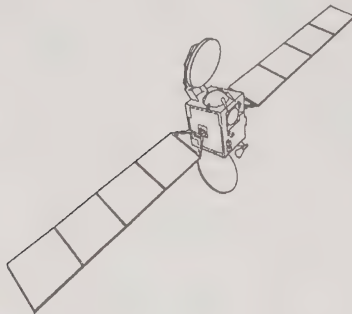
Arabsat II features greatly expanded C-band coverage beams which will allow future programmers to reach ground stations throughout North and Central Africa, and all of Western Europe and the Middle East via a single satellite transmission. This emulation of the Asiasat signal distribution concept should permit Arabsat to effectively compete with other regional systems planning on serving this part of the world. What's more, the high-powered Ku-band payload on Arabsat II also will give Arabsat the ability to offer DBS capabilities to its Arab League members at a fraction of the cost of building and launching national DBS satellites.

Arabsat II Spacecraft Bus

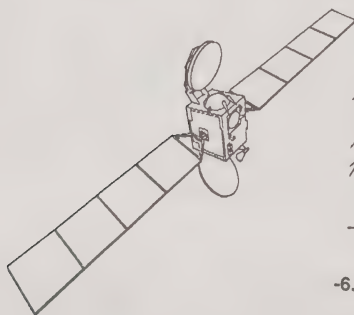
Arabsat II represents the first use of the new Spacebus 3000 platform, which has been developed by Aérospatiale and DASA. The three-axis stabilized Spacebus 3000 platform retains many of the features which have proven themselves in previous generations of the Spacebus platform series: a central tube in graphite epoxy housing the propellant tanks, and a main body formed of two U-shaped structures, one being the communications module and the other being the service module.

The bi-propellant propulsion and attitude control system uses the same principle applied by the previous spacebuses, but has increased performance because of the use of platinum/rhodium for the manufacturing of the motors. New modular propellant tanks have been developed for the Spacebus 3000, which makes it possible to optimize the mass. For Arabsat II, 1,546 kg of propellants will allow for a lifetime of sixteen years in orbit.

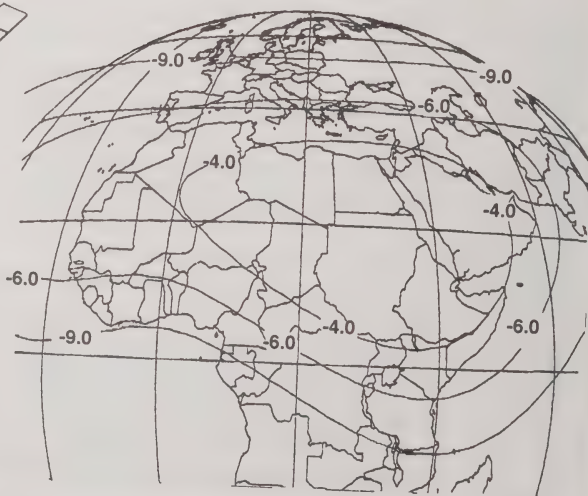
Among the innovations: an aluminum harness which reduces the weight of the wiring by almost 7 kg or 30 percent; a 42-volt regulated bus; and a dual gridded formed reflector for the Ku-band antenna.



Arabsat II High-Power
C-band EIRP Coverage
(LHCP Transponders)



Arabsat II Corresponding
C-band G/T Coverage
Beam



Arabsat II at a Glance

Operational History

Launch Date(s):	Mid-1995
Launch Provider:	Arianespace
Orbital Assignment:	26 degrees East Longitude
Status:	Under construction
Design Life:	16 years

Communications Payload

Frequency Band(s):	Receive: 5.925~6.425 GHz 13.75~14.00 GHz Transmit: 3.700~4.200 GHz 12.50~12.75 GHz
Channels:	11 C-band channels with RHCP 11 C-band channels with LHCP 6 Ku-band channels with "X" polarization 6 Ku-band channels with "Y" polarization
Channel Bandwidth:	20 C-band Transponders 36 MHz wide 2 C-band Transponders 54 MHz wide 8 Ku-band Transponders 36 MHz wide 4 Ku-band Transponders 30 Mhz wide
Antenna Coverage:	Arab League nations
Signal Power (EIRP):	High Powered C-band: 41 dBW Regular C-band: 35 dBW Ku-band: 47 dBW
TWTA Power:	C-band: 13 & 52 watts Ku-band: 90 watts

Spacecraft

Satellite Type:	Aérospatiale Spacebus 3000 three-axis stabilized spacecraft
Launch Weight:	2,500 kg
Payload Mass:	260 kg
Dimensions:	1.8 x 2.3 x 2.3 meters
Solar Array Span:	25 meters from tip to tip with solar arrays deployed
Antenna Height:	7 meters
Electrical Power:	5,000 watts at end of life
Telemetry Beacons:	3.7011 GHz 4.1999 GHz
Command Beacons:	5.9255 GHz

Arabsat II C-band Transponder Center Frequency Plan

Tr.	Pol	BW	U/L Frequency	D/L Frequency
01	RHCP	36	5945.25 MHz	3720.25 MHz
02	LHCP	36	5965.75 MHz	3740.75 MHz
03	RHCP	36	5986.25 MHz	3761.25 MHz
04	LHCP	36	6006.75 MHz	3781.75 MHz
05	RHCP	36	6027.25 MHz	3802.25 MHz
06	LHCP	36	6047.75 MHz	3822.75 MHz
07	RHCP	36	6058.25 MHz	3843.25 MHz
08	LHCP	36	6080.75 MHz	3863.75 MHz
09	RHCP	36	6109.25 MHz	3884.25 MHz
10	LHCP	36	6129.75 MHz	3904.75 MHz
11	RHCP	36	6150.25 MHz	3925.25 MHz
12	LHCP	36	6170.25 MHz	3945.75 MHz
13	RHCP	54	6203.25 MHz	3978.25 MHz
14	LHCP	54	6223.75 MHz	3998.75 MHz
15	RHCP	36	6258.75 MHz	4043.75 MHz
16	LHCP	36	6282.50 MHz	4057.50 MHz
17	RHCP	36	6309.75 MHz	4084.75 MHz
18	LHCP	36	6323.50 MHz	4098.50 MHz
19	RHCP	36	6350.75 MHz	4125.75 MHz
20	LHCP	36	6364.50 MHz	4139.50 MHz
21	RHCP	36	6391.75 MHz	4166.75 MHz
22	LHCP	36	6405.50 MHz	4180.50 MHz

Note: As of April 17, 1993. Final frequency plan optimization may lead to slight channel center frequency adjustments.

*Arabsat II High-Power
Ku-band EIRP Coverage
Beam*

1st contour: 47 dBW
2nd contour: 45 dBW
3rd contour: 43 dBW
4th contour: 41 dBW



Arabsat II Ku-Band Transponder Center Frequency Plan

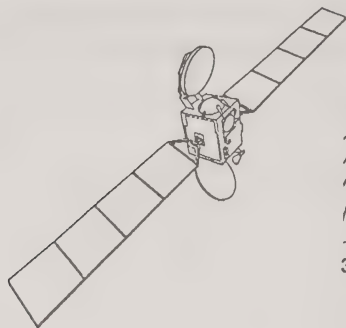
Tr.	Pol	BW	U/L Frequency	D/L Frequency
01	X	—	13768.0 MHz	12521.0 MHz
02	Y	—	13783.0 MHz	12535.0 MHz
03	X	—	13809.5 MHz	12552.5 MHz
04	Y	—	13824.8 MHz	12577.8 MHz
05	X	—	13851.5 MHz	12604.5 MHz
06	Y	—	13886.5 MHz	12619.5 MHz
07	X	—	13893.3 MHz	12646.3 MHz
08	Y	—	13908.3 MHz	12661.3 MHz
09	X	—	13932.1 MHz	12685.1 MHz
10	Y	—	13947.1 MHz	12700.1 MHz
11	X	—	13967.0 MHz	12720.0 MHz
12	Y	—	13982.0 MHz	12735.0 MHz

Note: As of April 17, 1993. Final frequency plan optimization may lead to slight channel center frequency adjustments.

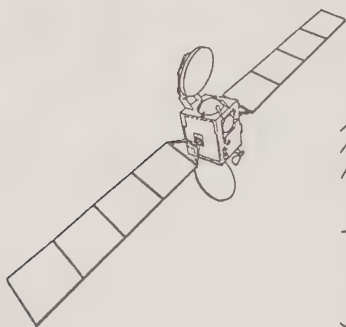
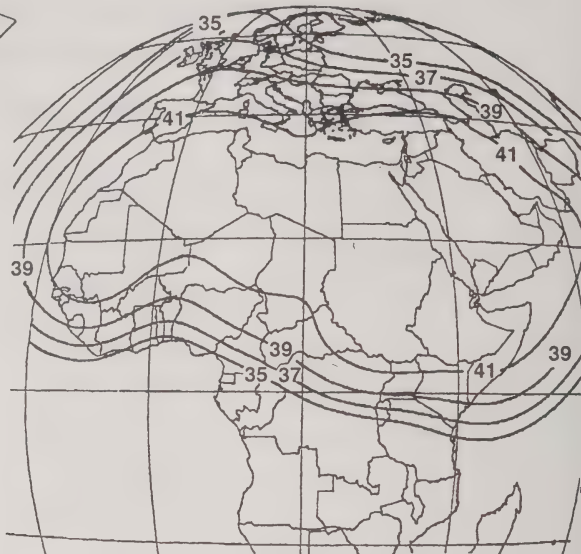
*Arabsat II Ku-band
G/T Uplink Coverage*

1st contour: 2 dB/K
 2nd contour: 0 dB/K
 3rd contour: -2 dB/K
 4th contour: -4 dB/K
 5th contour: -6 dB/K





*Arabsat II High-Power
C-band EIRP Coverage
(RHCP Transponders)*



*Arabsat II Corresponding
C-band G/T Coverage
Beam*



Chapter Seven: The Tongasat, Rimsat, and Unicom Satellite Systems

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Dr. Matt Nilson, Director
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16 Raffles Quay, Singapore 0104
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Fax: (65) 225-9060

Tongasat

Dr. Matt Nilson founded Tongasat in early 1988, after having been personally granted an exclusive fifty-year franchise by His Majesty The King to register orbital positions on behalf of the Government of the Kingdom of Tonga, and to arrange for entities to launch and/or operate satellites in orbital positions registered to Tonga. Tongasat is owned by three shareholders, with the majority held by its Chairperson, HRH Princess Salote Pilolevu, the only daughter of His Majesty The King.

In 1991, Tongasat negotiated an Agreement with Unicom Satellite Corporation of Aspen, Colorado, for the use of two orbital positions (138 and 170.75 degrees East), an option for the use of a third position (70 degrees East), and with rights of first refusal under certain conditions for additional positions, not yet committed to others. In April of 1992, Tongasat enlisted the assistance of Rimsat Ltd., of Ft. Wayne, Indiana, to procure and lease Russian satellites for launch into the remaining Tonga orbital positions.

According to Tongasat, the relationships between them and Rimsat and Unicom connote mutually desirable partnerships or joint ventures, rather than just legal agreements for the use of the orbital positions. They are essential partnerships, in which neither party can perform the communications services planned without the other.

The Rimsat Satellite System

Rimsat Ltd., is a U.S. company based in Fort Wayne, Indiana, which has contracted with Tongasat—the authorized satellite entity of the Kingdom of Tonga—for use of its registered orbital positions, and with the Russian Space Agency for use of multiple Russian communications satellites.

On November 12, 1992, Rimsat of Fort Wayne, Indiana, entered into an agreement with the Russian Space Agency to acquire a minimum of two in-orbit Russian communications satellites and four new next-generation Express satellites, in order to market international satellite services in Southeast Asia and the Pacific Rim beginning in 1993. In April of 1992, Rimsat entered into an agreement with Tongasat to use the orbital locations of 134, 130, and 142.5, and 83 degrees East Longitude, which the Kingdom of Tonga previously had registered with the ITU's International Frequency Registration Board.

These orbital positions were intentionally selected to provide service to a vast area that runs from Iran, Pakistan and India in the West—covering China, Australia, New Zealand, and all of Southeast Asia—to the Hawaiian Islands in the East, thereby providing single-hub interconnection to North America. Other notable inclusions in Rimsat's coverage area are the Islands of the South Pacific.

Orbital Dispute

Gorizont 17 arrived at 134 degrees East Longitude in the second quarter of 1993. However, Rimsat was unable to begin operations because Indonesia's inclined-orbit Palapa B1 satellite previously had been moved to this orbital location in 1992. Moreover, both Columbia Communications Corp., and PanAmSat have filed comments with the FCC asking the Commission to deny landing rights for the Rimsat satellite at 134 degrees East Longitude to interface with U.S. based earth stations and to take measures in the appropriate international forums to oppose Tonga's claims on the disputed orbital position. The reason: their claim that Tonga is offering the orbital arc as a commodity for sale.

In late 1993, however, the Rimsat and Palapa Pacific satellite operators reached an agreement to collocate both satellites at 134 degrees East Longitude and coordinate transmissions to prevent interference between the two spacecraft. (For more information about Asian orbital disputes, see Chapter Two: "Star Wars Along Asia's Satellite Superhighways").

Rimsat's Future Plans

Rimsat's second satellite, Gorizont 28, arrived at 130 degrees East Longitude in the fourth quarter of 1993. Both Gorizont spacecraft are operated in an inclined orbit mode. The first of four new Express satellites is scheduled to become available in October of 1994, with three additional Express satellites to be launched to Rimsat orbital positions in 1995 and 1996.

The Gorizont coverage beams are steerable one time in orbit, while the Express coverage beams will offer more extensive in-orbit steerability. In the **Gorizont satellites**, three independently steerable beams—**spot, zonal, and hemispheric**—allow for great flexibility in addition to the global beam.

Rimsat intends to offer a variety of international and domestic satellite telecommunications services via its Russian satellites, including TV distribution and VSATs for business communications. According to recent reports, TT&C for the Russian satellites will be handled by the Russian Space Agency.

Express Satellites

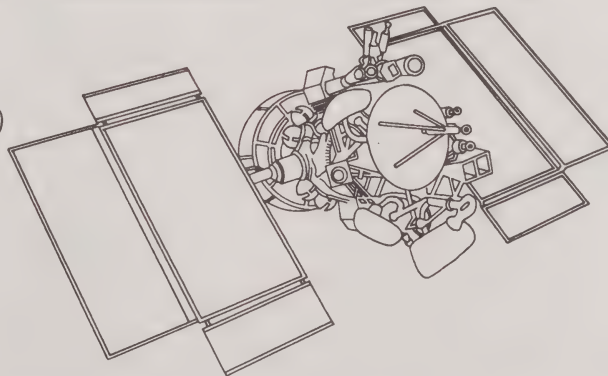
Beginning in 1994, the Russians will begin launching a new series of Express dual-band satellites. Based on the tried and true Gorizont spacecraft bus (twenty-nine flight models already placed in orbit), Express will offer additional capacity, a longer mission lifetime (five to seven years versus the three years average for Gorizont spacecraft), and a superior stationkeeping capability.

Express satellites will carry ten C-band (Trs. 6 to 11, 13 to 17) and two Ku-band (Trs. 12 & 20) transponders versus the six C-band transponders and one Ku-band transponder provided by existing Gorizont satellites.

All Express satellites will feature extensive in-orbit steerability of its spot beams. Gorizont satellites only allow for a one-time adjustment of beam pointing in orbit.

As part of its own domestic satellite system, Russia intends to begin launching Express satellites to 11 and 14 degrees West Longitude, and 40, 53, 80, 90, 96.5, 103, and 140 degrees East Longitude. Moreover, the Russians have agreed to supply Rimsat with multiple Express satellites for a Pacific Ocean Region satellite system and supply SOVCAN Star joint venture between Russian and Canadian companies with an Express satellite at 145 degrees East Longitude. INTELSAT already has acquired one Express satellite and holds options to acquire several more Express satellites for its Asian Landmass satellite cluster at 69, 85, 91.5, and 95 degrees East Longitude.

1340 - G17
1300 - G28
(142.5 - L7Kels New)



Express At A Glance

Spacecraft type:	Three-axis Stabilized
Spacecraft Manufacturer:	NPO-PM
Satellite Mass:	2,500 kg
Electrical Power:	2,700 watts
Stationkeeping Accuracy:	±0.2 degrees
Frequency Bands:	6/4, 14/11
Rimsat Orbital Locations:	134, 130, & 142.5 degrees East
Mission Lifetime:	5 to 7 years

Frequency Bands:	Uplink:	5.925~6.475 GHz 14.30~14.40 GHz
	Downlink:	3.650~4.200 GHz 11.50~11.60 GHz
Transponders:	C-band:	12
	Ku-band	2
Polarization:		Circular

Transmit Beams (C-band):

Global 17° x 17° (Tr. 6)	PFD: -130 dBW/m ² EIRP: 32.6 dBW
Global 15° x 15° (Tr. 7 to 11, 15 & 17)	PFD: -133 dBW/m ² EIRP: 25.9 or 30.4 dBW*
Zone 5° x 11° (Tr. 7 to 11, 15 & 17)	PFD: -127 dBW/m ² EIRP: 31.7 or 36.2 dBW*
Spot 5° x 5° (Tr. 6, 14 & 16)	PFD: -120 dBW/m ² EIRP: 35.2 or 43.1 dBW*

Transmit Beams (Ku-band):

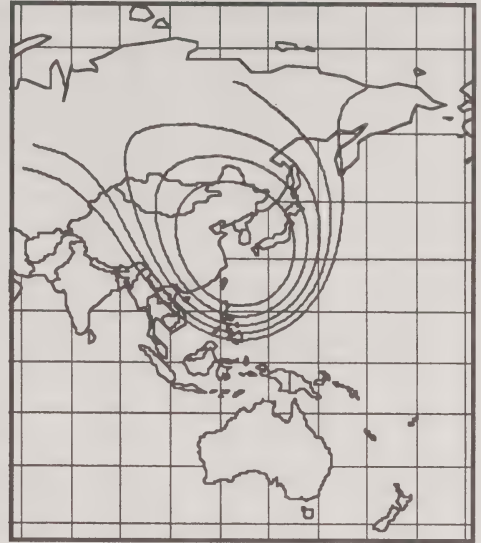
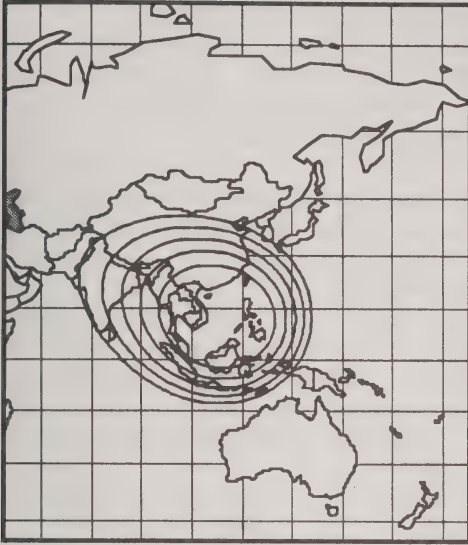
Spot 5° x 5° (12 & 20)	PFD: -127 dBW/m ² EIRP: 36.2 dBW
------------------------	--

Receive Beams

Global 17° x 17° (Tr. 6, 7 to 11, 15 & 17)	G/T: -14 dB/K
Zone 5° x 11° (Tr. 6 to 11, 15 to 17)	G/T: -7 dB/K
Ku-band Spot 6° x 6° (Tr. 12 & 20)	G/T: -5 dB/K

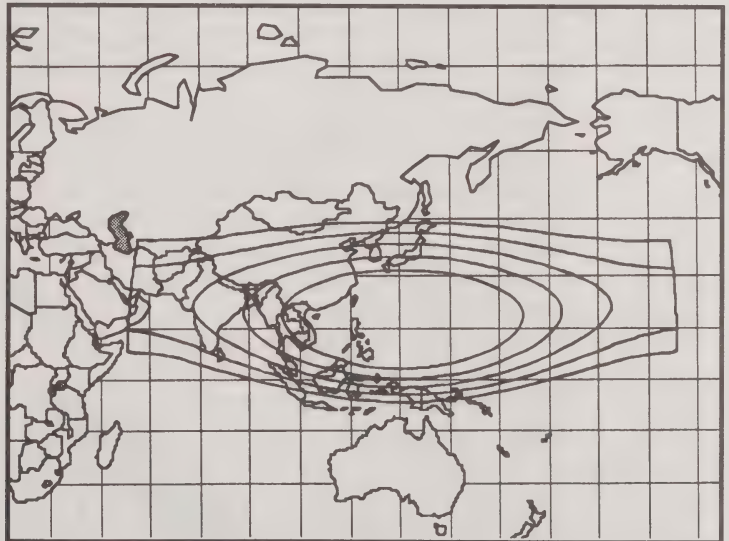
*Low-power versus high-power modes. (Note: All EIRPs are - 2 dB from peak saturated transponder values.)

POSSIBLE RIMSAT SATELLITE COVERAGE BEAMS - 134 DEGREES EAST



(Above). Possible Rimsat C-band spot beam coverage using Russian Gorizont or Express satellites from 130 or 134 degrees East Longitude. Gorizont satellites allow for one-time in-orbit beam pointing, while Express satellites will have the versatility of being able to re-steer the C-band spot and zone beams via ground command. All beams will be steered to satisfy the specific needs of Rimsat customers.

(Right). Possible Express regional zone beam coverage from Rimsat orbital positions of 130 or 134 degrees East Longitude. The zone beam will be steerable (up/down only) via ground command.



The Unicom Satellite System

On November 23, 1991, Unicom Satellite Corporation announced the signing of an Agreement with the Kingdom of Tonga under which Unicom is authorized to operate satellites in two (170.75 and 70 degrees East Longitude) of Tonga's six orbital positions registered with the International Frequency Registration Board (IFRB). Under the agreement, Unicom also holds options on other Tonga orbital positions as required.

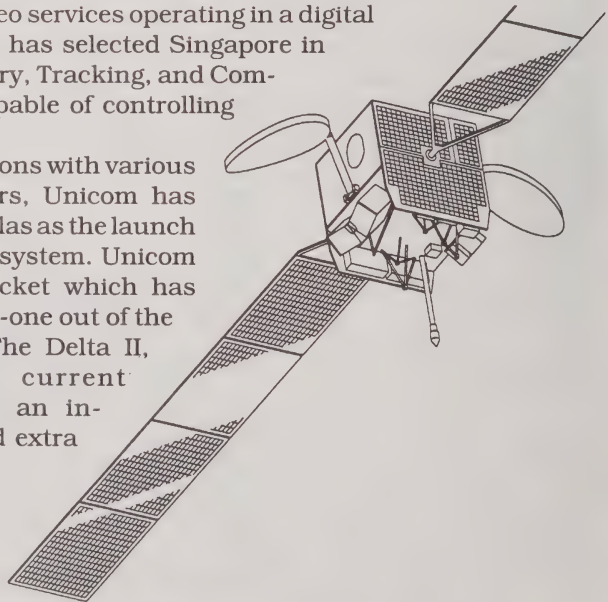
Unicom further announced that it has signed a contract to purchase two "Ultrasat XXIV" satellites from Fairchild Space and Defense, a member of the Matra Group, subject to the satisfaction of certain conditions. Ultrasat XXIV utilizes advanced technology with heritage components derived from a variety of Matra/Fairchild satellite programs.

The modular construction is designed around a dual-mode propulsion subsystem that provides a ten-year mission lifetime with a minimum amount of fuel, while the integral power control and distribution unit combines the functions of many boxes into one, to save both space and mass. Each Ultrasat satellite can achieve a mass of 950kg and a solar array output of up to 2,600 watts at beginning of life.

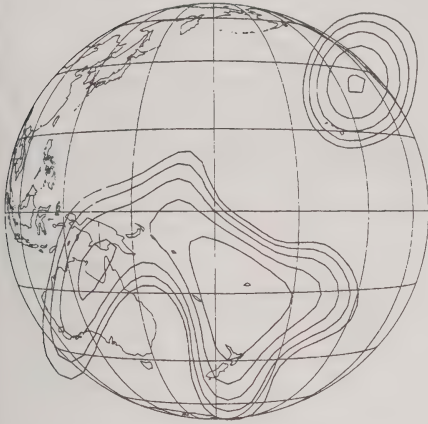
Each Unicom satellite will carry twenty-four C-band (20 watt SSPAs) transponders with a 36 MHz bandwidth and six Ku-band (50 watt TWTAs) transponders with a 36 MHz bandwidth. Transponders will use vertical polarization for the uplink signals and horizontal polarization on the downlink signals. Footprint coverage has been designed to allow service into 3m antennas in the C-band and 1.8m antennas in the Ku-band.

Unicom satellites will carry a mix of video, data, private television and private video services operating in a digital or analog mode. Unicom has selected Singapore in which to locate a Telemetry, Tracking, and Command (TT&C) facility capable of controlling multiple satellites.

After extensive discussions with various launch services providers, Unicom has selected McDonnell Douglas as the launch provider for the Unicom system. Unicom will use the Delta II rocket which has flown successfully eighty-one out of the last eighty-two times. The Delta II, McDonnell Douglas' current launcher, provides for an increased payload size and extra weight capabilities.

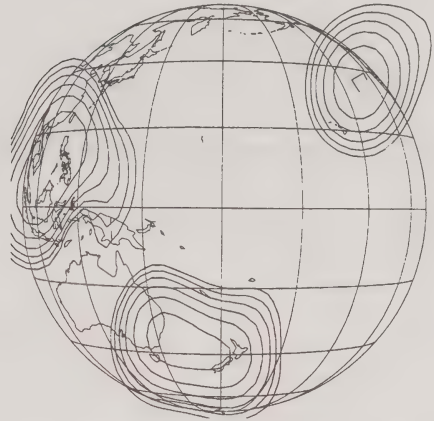


*Unicom C-band EIRP Contours
from 170 degrees East*



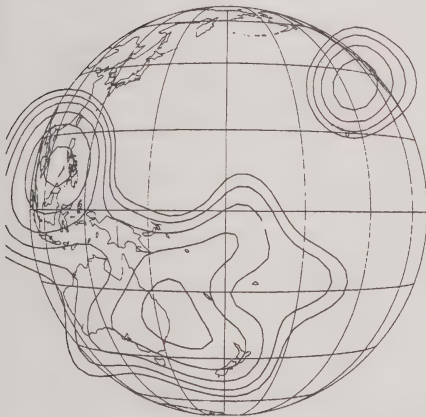
	<i>South Beam</i>	<i>East Beam</i>
Peak EIRP:	39.0 dBW	36.0 dBW
1st contour:	36.0 dBW	34.0 dBW
2nd contour:	34.0 dBW	32.0 dBW
3rd contour:	32.0 dBW	30.0 dBW
4th contour:	30.0 dBW	28.0 dBW
5th contour:	28.0 dBW	

*Unicom C-band EIRP Contours
from 170 degrees East*



	<i>West & South Beams</i>	<i>East Beam</i>
Peak EIRP:	38.5 dBW	36.0 dBW
1st contour:	36.0 dBW	34.0 dBW
2nd contour:	34.0 dBW	32.0 dBW
3rd contour:	32.0 dBW	30.0 dBW
4th contour:	30.0 dBW	28.0 dBW
5th contour:	28.0 dBW	26.0 dBW
6th contour:	26.0 dBW	

*Unicom C-band G/T Contours
from 170 degrees East*



	<i>West Beam</i>	<i>East Beam</i>
1st contour:	-2.0 dB/K	-4.0 dB/K
2nd contour:	-4.0 dB/K	-6.0 dB/K
3rd contour:	-6.0 dB/K	-8.0 dB/K
4th contour:	-8.0 dB/K	-10.0 dB/K
5th contour:	-10.0 dB/K	

*Unicom Ku-band EIRP Contours
from 170 degrees East*



Peak EIRP:	51.6 dBW
1st contour:	50.0 dBW
2nd contour:	48.0 dBW
3rd contour:	46.0 dBW
4th contour:	44.0 dBW

*Unicom Ku-band G/T Contours
from 170 degrees East*



Peak G/T:	6 dB/K
1st contour:	4 dB/K
2nd contour:	2 dB/K
3rd contour:	0 dB/K
4th contour:	-2 dB/K
5th contour:	-4 dB/K

*Unicom C-band EIRP Contours
from 70 degrees East*



Peak EIRP:	40.0 dBW
1st contour:	38.0 dBW
2nd contour:	36.0 dBW
3rd contour:	34.0 dBW
4th contour:	32.0 dBW
5th contour:	30.0 dBW
6th contour:	28.0 dBW

*Unicom Ku-band EIRP Contours
from 70 degrees East*



	<i>West Beam</i>	<i>East Beam</i>
Peak EIRP:	51.6 dBW	49.6 dBW
1st contour:	50.0 dBW	48.0 dBW
2nd contour:	48.0 dBW	46.0 dBW
3rd contour:	46.0 dBW	44.0 dBW
4th contour:	44.0 dBW	42.0 dBW
5th contour:	42.0 dBW	40.0 dBW
6th contour:	40.0 dBW	38.0 dBW

*Unicom Ku-band G/T Contours
from 70 degrees East*



Peak G/T:	6 dB/K
1st contour:	4 dB/K
2nd contour:	2 dB/K
3rd contour:	0 dB/K
4th contour:	-2 dB/K
5th contour:	-4 dB/K

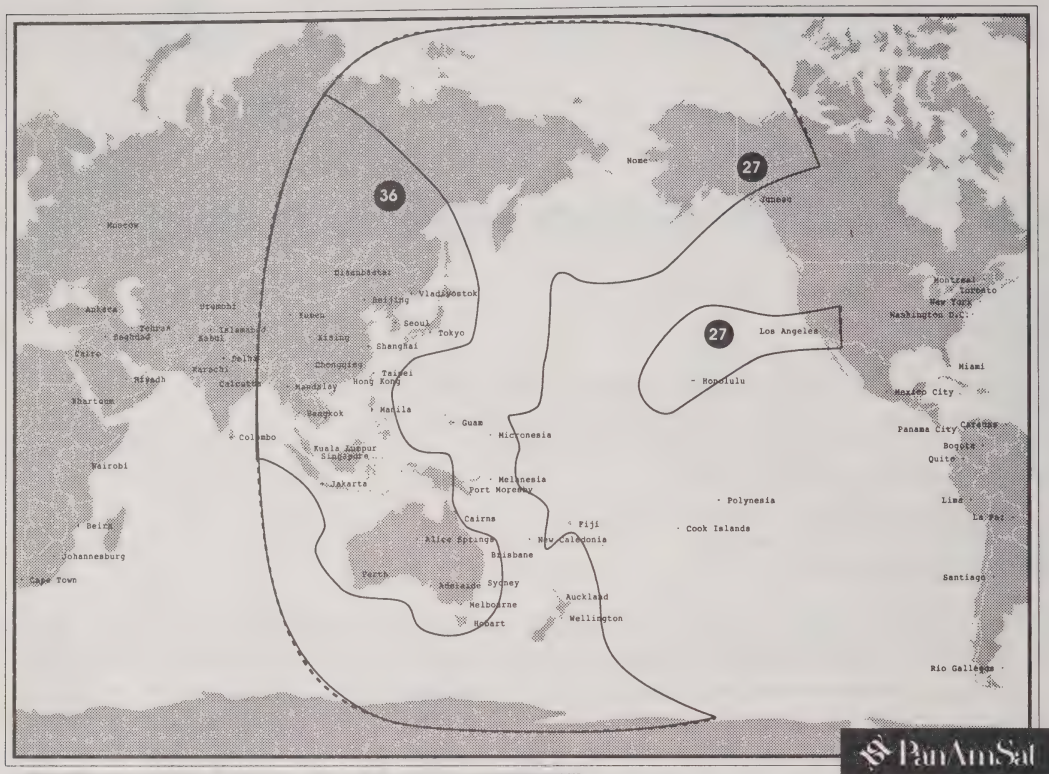
Chapter Eight: ***The PanAmSat Global Satellite System***

PanAmSat
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On July 15, 1988, PanAmSat, an international satellite operator based in the United States, launched PAS-1—the world's first privately-owned international satellite—to an orbital assignment over the Atlantic Ocean Region. PanAmSat was conceived following a 1984 U.S. Presidential determination that international satellite systems separate from the INTELSAT satellite system were required in the U.S. national interest. This determination recognized the potential trade benefits for the U.S. in the development of separate satellite systems and the further commercialization of space. Based in Greenwich, Connecticut, PanAmSat is owned by Alpha Lyracom, a sole proprietorship of Rene Anselmo.

PanAmSat Expansion into the Asia/Pacific Region

In 1990 and 1991, PanAmSat (PAS) filed applications with the U.S. Federal Communications Commission to construct, launch, and operate three new international satellites in the Pacific, Atlantic, and Indian Ocean Regions, respectively. In late 1991, PanAmSat signed an agreement with Hughes Aircraft Company of El Segundo, California, for the construction of the three satellites using the Hughes HS 601 three-axis stabilized satellite platform. PanAmSat has named the three new satellites PAS-2 (191 degrees West / 169 degrees East Longitude), PAS-3 (43 degrees West Longitude) and PAS-4 (72 degrees East Longitude). All three satellites will be hybrids, providing both C-band and Ku-band coverage from their designated orbital assignments. Financing for the three new satellites has been arranged through a US\$ 200 million investment by Mexican media company Grupo Televisa and through a US\$ 440 million public bond offering.



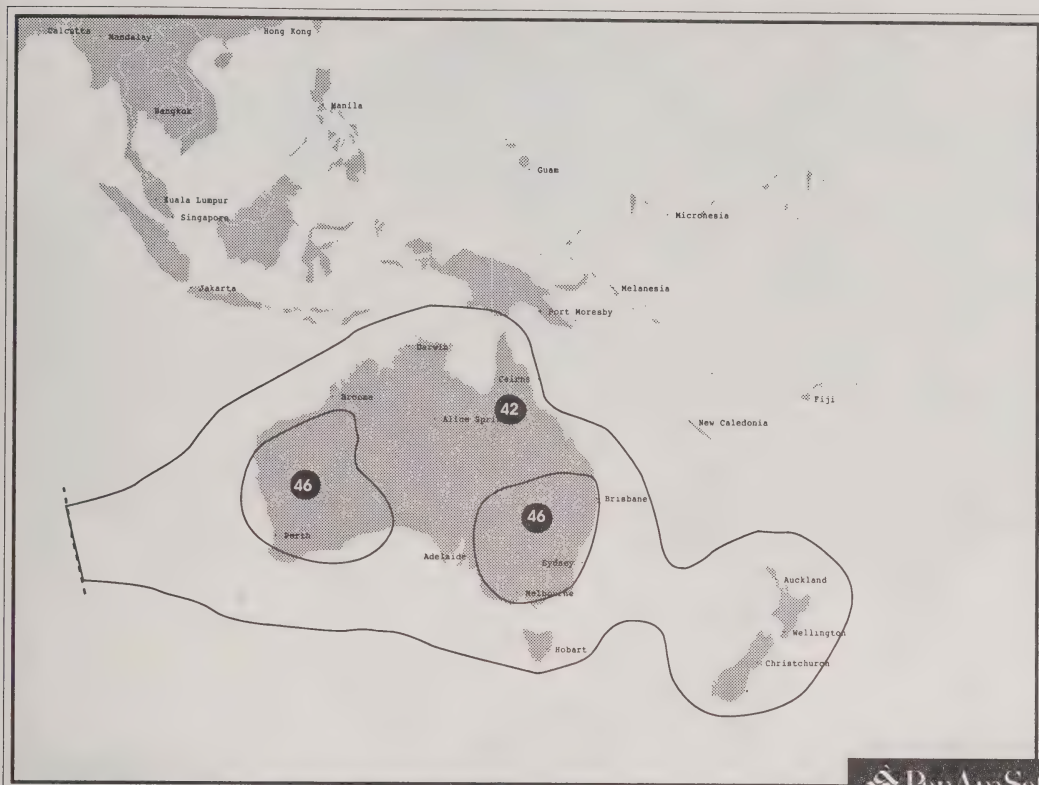
PAS-2 Pacific Rim Beam • C-Band

EIRP Levels

PAS-2 is scheduled for an Ariane launch in May, 1994, with PAS-3 and PAS-4 slated for launch in late 1994 and early 1995, respectively. PAS-2 will serve the Asia/Pacific Region, from Thailand to the U.S. West Coast and from Russia to New Zealand, including spot beam service over Northeast Asia, China, Australia and New Zealand. PAS-3, the follow-on satellite to PAS-1, will cover the Atlantic Ocean Region for services within and between the Americas and Europe as well as coverage of Africa. PAS-4 completes PanAmSat's global coverage by serving the Indian Ocean Region, with coverage from Europe to Japan, including Central and Eastern Europe, Africa, Russia, the Commonwealth of Independent States, the Middle East, Southeast Asia, China, and Australia.

Technical Description

The PAS-2, PAS-3, and PAS-4 are advanced hybrid communication satellites with sixteen C-band and sixteen Ku-band transponders. The satellite lifetime is estimated to be fifteen years. The satellites will be equipped with sufficient battery power to enable operation at full capacity during periods of solar eclipse.



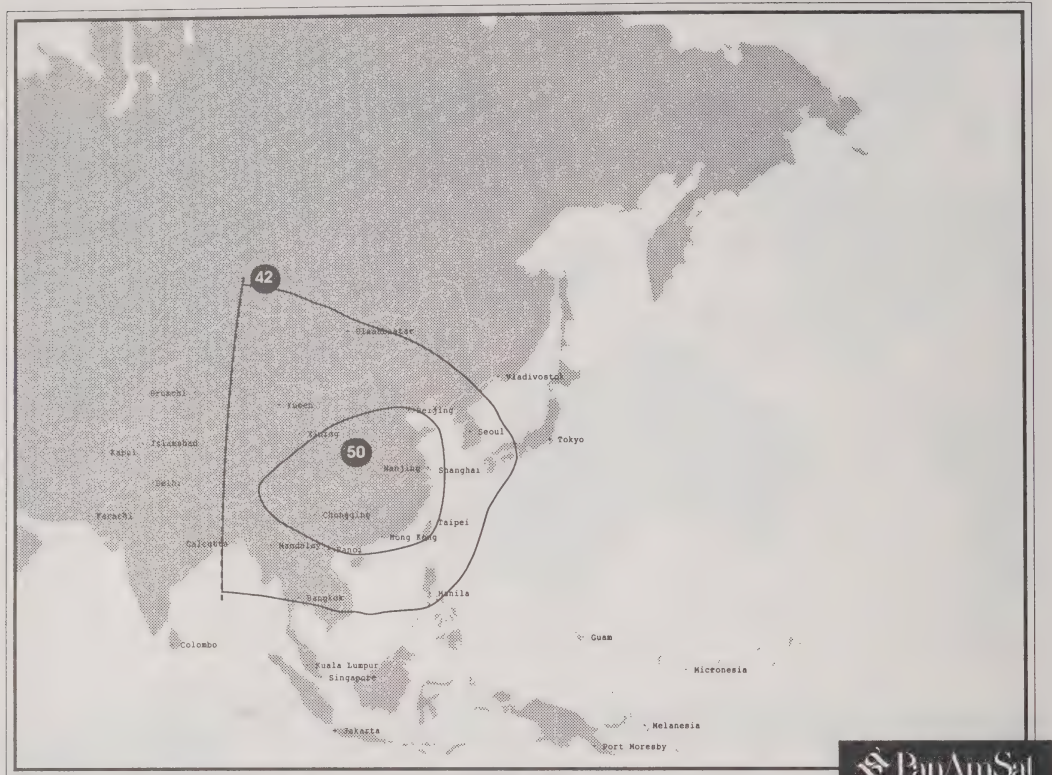
PanAmSat

PAS-2 Australia/New Zealand Beam • Ku-Band

EIRP Levels

Each satellite provides sixteen C-band transponders with 34 watt SSPAs, and sixteen Ku-band transponders with 63 watt TWAs. Transponder bandwidths are either 54 or 64 MHz. The long lead time before the launch of PAS-4 (1995) permits extensive changes to the PAS-4 payload and beam contours based on perceived market requirements and customer requests. All three satellites employ the latest advancements in satellite technology, including: shaped-beam reflectors, cross-strappable beams, and beam switchability. By tailoring specific coverage areas, beam shaping ensures that satellite power is not wasted over largely unpopulated ocean areas, with supplemental "hot spots" over strategic population centers. The cross-strapping capability provides optimal flexibility in uplinking and downlinking in both Ku-band and C-band, permitting customers to design hybrid, cost-effective networks to meet their individual needs in areas such as frequency coordination, earth station siting, and weather conditions for each coverage area.

The command system for all three satellites will be fully encrypted to prevent unauthorized commands from entering the system, thus protecting



PAS-2 China Beam • Ku-Band

EIRP Levels

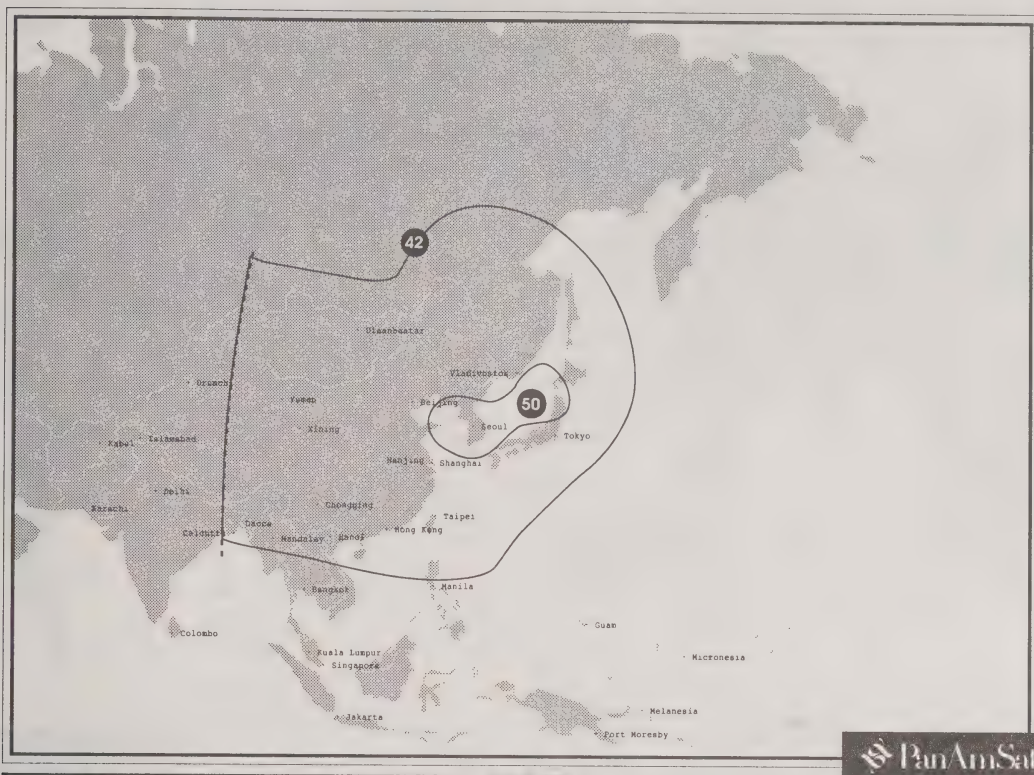
the integrity of the satellites. The gain step attenuators for each transponder are ground commandable in 1 dB increments for a range of up to 15 dB.

PanAmSat currently operates a Homestead, Florida, Teleport, which provides C- and Ku-band services on the PAS-1 satellite, interconnection with domestic services, and links to domestic and regional satellite systems. To support additional system demands and the addition of the three new satellites, PanAmSat is planning and procuring earth station facilities on the U.S. West Coast, the Eastern U.S., Europe, and the Far East.

PAS-1 TT&C is performed by GTE Spacenet out of its McLean, Virginia, control center via remote earth station facilities. Similarly, PAS-2, PAS-3, and PAS-4 TT&C will be performed by Hughes through remote sites linked to their El Segundo control center.

PAS-2 Technical Overview

The following technical overview for the PAS-2 Pacific Ocean Region satellite summarizes material received by the publisher in the Fall of 1993.



PAS-2 North East Asia Beam • Ku-Band

EIRP Levels

Readers can use the following PAS-2 technical summary to project how the PAS-4 satellite for the Indian Ocean Region may be constructed. However, keep in mind that the beam coverage zones, the number of transponders, and other parameters may change to some extent between PAS-2 and PAS-4, given that PAS-4 is not scheduled for launch until 1995. The number of transponders utilized in a satellite is a function of the manner in which the operator decides to divide the available frequency band and whether geographic separation is used to allow frequency reuse in addition to polarization reuse. These changes, which depend on perceived customer demand, could include a shift in the total number of transponders and/or the bandwidth assigned to each transponder.

C-band Operation. At C-band, the PAS-2 satellite will have sixteen transponders. Eight transponders will have a bandwidth of 54 MHz and four transponders will have a bandwidth of 64 MHz, with eight transponders available for each polarization. Uplinking occurs from 5.925 GHz to 6.425 GHz, while satellite downlinking occurs in the 3.7 GHz to 4.2 GHz band. All polarizations are linear vertical or horizontal.



PAS-2 Oceania Beam • C-Band

EIRP Levels

Ku-band Operation. Sixteen transponders, eight with 54 MHz bandwidth and four with 64 MHz bandwidth, will be employed on the PAS-2 satellite at Ku-band; as at C-band, they will be linearly cross-polarized. The satellite downlink band is split into two segments: the 11.7~12.2 or 12.25~12.75 GHz bands. While this mode of operation may require additional receivers in the satellite, the additional complexity is outweighed by the advantages in providing access to both bands.

PanAmSat Announces Prelaunch Customers for New Satellites

On December 3, 1993, PanAmSat announced that it had pre-launch agreements on the books for US\$ 958 million for future satellite capacity on its Global Satellite System. The announcement came six months prior to the launch of PanAmSat's PAS-2 Pacific Ocean Region satellite and more than a year prior to the launch of PAS-3 (Atlantic Ocean Region) and PAS-4 (Indian Ocean Region). Included are some of the world's leading TV and radio programmers, including Turner Broadcasting (USA), ESPN International (USA), Grupo Televisa (Mexico), MNET (South Africa), SABC / Sentech (South Africa), and the ABS-CBN Broadcasting Corporation (Philippines).

For example, ABS-CBN will use PanAmSat services for Asia/Pacific and transpacific program distribution, while MNET will meet its domestic South African requirements and reach into new markets abroad. Similarly, international programmers, such as ESPN, Televisa, and Turner Broadcasting, will use PanAmSat to expand their distribution networks to cable and broadcast outlets around the world.

PAS-2 at a Glance

Operational History

Launch Date(s):	May, 1994
Launch Provider:	Arianespace
Orbital Assignment:	169 degrees East Longitude
Status:	Under construction
Design Life:	15 years

Communications Payload

Frequency Band(s):	Receive:	5.925~6.425 GHz
		14.00~14.50 GHz
	Transmit:	3.700~4.200 GHz
		11.7 - 12.2 GHz or <i>-K2</i> 12.20~12.75 GHz <i>-K3</i>
Channels:	16 C-band channels 16 Ku-band channels	
Polarization:	Horizontal & Vertical	
Channel Bandwidth:	12 C-band Transponders 54 MHz wide	
	4 C-band Transponders 64 MHz wide	
	12 Ku-band Transponders 54 MHz wide	
	4 Ku-band Transponders 65 MHz wide	
Antenna Coverage:	PAS-2: Asia/Pacific Region, including U.S. West Coast	
Signal Power (EIRP):	C-band:	32 to 38 dBW
	Ku-band:	44 to 52 dBW
SFD (Beam Center):	C-band:	-99 dBW/m ²
	Ku-band:	-90 dBW/m ²
G/T:	C-band:	-1.0 - -9.0 dB/K
	Ku-band:	+2.5 to -5.0 dB/K
SSPA Power:	C-band:	34 watts
TWTA Power:	Ku-band:	63 watts

Spacecraft

Satellite Type:	Hughes HS-601 Three-axis stabilized spacecraft
Telemetry Beacons:	4.1985 GHz [HP] 4.1995 GHz [HP]
Command Beacons:	12.50 GHz (RHCP & LHCP)



PAS-4 Indian Ocean Region

Ku-Band & C-Band
Downlink Beams

PAS-2 C-Band Transponder Plan

Tr	Pol	U/L Freq.	D/L Freq.	Beam
1	V	5955 MHz	3730 MHz	V2
2	H	5955 MHz	3730 MHz	H2
3	V	6015 MHz	3790 MHz	V1
4	H	6015 MHz	3790 MHz	H1/O
5	V	6075 MHz	3850 MHz	V2
6	H	6075 MHz	3850 MHz	H2
7	V	6140 MHz	3915 MHz	V1/O
8	H	6140 MHz	3915 MHz	H1
9	V	6205 MHz	3980 MHz	V2
10	H	6205 MHz	3980 MHz	H2
11	V	6265 MHz	4040 MHz	V1/O
12	H	6265 MHz	4040 MHz	H1
13	V	6325 MHz	4100 MHz	V2
14	H	6325 MHz	4100 MHz	H2
15	V	6390 MHz	4165 MHz	V1/O
16	H	6390 MHz	4165 MHz	H1

† 64 MHz; others 54 MHz. V/H = Pacific; O = Oceania

PAS-2 Ku-band Transponder Plan

Tr	Pol	U/L Freq.	Pol	D/L Freq.	Beam
1	V	14029 MHz	H ⁷⁸¹	12281 MHz	China 1
2	H	14029 MHz	V ⁹⁸¹	12281 MHz	Aust.
3	V	14089 MHz	H ¹⁰⁴¹	12341 MHz	China 2
4	H	14089 MHz	V ¹⁰⁴¹	12341 MHz	NE Asia
5	V	14149 MHz	H ¹¹⁶¹	12401 MHz	China 1
6	H	14149 MHz	V ¹¹⁶¹	12401 MHz	Aust.
7	V†	14214 MHz	H ¹¹⁶⁶	12466 MHz	C2/Aust.
8	H†	14214 MHz	V ¹¹⁶⁶	12466 MHz	NE Asia
9	V	14279 MHz	H ¹²³¹	12531 MHz	China 1
10	H	14279 MHz	V ¹²³¹	12531 MHz	Aust.
11	V	14339 MHz	H ¹²³¹	12591 MHz	C2/Aust.
12	H	14339 MHz	V ¹²³¹	12591 MHz	NE Asia
13	V	14399 MHz	H ¹³⁵¹	12651 MHz	China 1
14	H	14399 MHz	V ¹³⁵¹	12651 MHz	Aust.
15	V†	14464 MHz	H ¹⁴¹⁶	12716 MHz	C2/Aust.
16	H†	14464 MHz	V ¹⁴¹⁶	12716 MHz	NE Asia

† 64 MHz; others 54 MHz. C = China; Aust. = Australia

Chapter Nine:

The Columbia and PacifiCom Regional Satellite Systems

TRW Space & Electronics Group
One Space Park
Building R9/Room 2181
Redondo Beach, California 90278
Susan Brough, Manager, Public Relations
Tel: (310) 814-8888
Fax: (310) 814-1400

On August 23, 1990, the FCC received a request from Columbia Communications Corp., of Honolulu, for the authority to lease C-band transponders aboard NASA's Tracking and Data Relay Satellite (TDRS) spacecraft, located at 41 degrees and 174.3 degrees West Longitude. The company subsequently signed a contract with NASA for the lease of twenty-four C-band TDRS transponders over a six year period. In 1993, this contract was amended to include a revenue sharing arrangement between NASA and Columbia.

The TDRS satellite network is one of the largest and most sophisticated communications satellite systems ever built. NASA's US\$ 2.6 billion telecommunications network provides worldwide communications links during shuttle missions and between numerous spacecraft. TDRS eventually will replace NASA's network of twenty-three tracking stations scattered throughout the world.

The Columbia/TDRS System

The Columbia/TDRS satellite system consists of twenty-four in-orbit C-band transponders carried by two TDRS satellites: twelve over the Atlantic Ocean TDRS-4 satellite (launched by NASA on March 13, 1989) at 41 degrees West Longitude and twelve on the TDRS-5 satellite (launched by NASA on August 2, 1991) located at 174.3 degrees West (185.7 degrees East) Longitude. Columbia's customers control their individual transponders. Transmission to the satellites is achieved through customer earth stations or through gateway facilities.

The C-band transponders and their associated 5.5 watt TWTAs can generate a peak EIRP level of 36 dBW (32.5 dBW over Northeast Asia). The 174.3 degrees West Longitude location provides coverages of the West coast

of the U.S., Eastern Asia, and an intervening area over the Pacific Ocean, while the 41 degrees West Longitude location provides coverage of portions of the contiguous U.S., Western Europe, and an intervening area over the Atlantic Ocean. Uplinking to TDRS-Pacific can take place from either Northeast Asia or the U.S. West Coast. TDRS C-band uplinks use antennas ranging from 16 to 33 feet (5 to 11m) in diameter, while C-band downlinks use antennas ranging from 6.5 to 16 feet (2 to 5m) in diameter.

Access to the satellites from the U.S. is possible through a customer's own earth station or through an existing gateway facility. Services based in other countries operate in conjunction with foreign business partners such as cable system operators, gateway service providers, and foreign Postal Telephone and Telegraph (PTT) agencies.

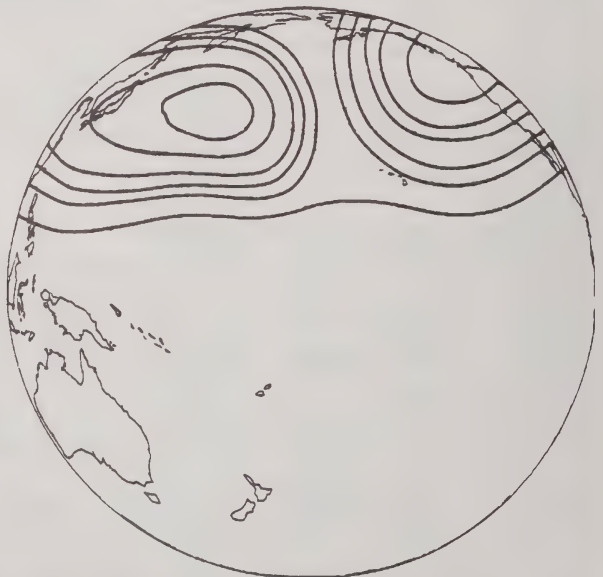
Columbia Signs Transponder Pact with TRW

In 1992, TRW Space & Electronics Group became Columbia Communications Corporation's anchor tenant for commercial transponder capacity on the TDRS satellites at 174.3 degrees West Longitude and 41 degrees West Longitude. Under a six-year lease agreement, the companies are jointly marketing international services to customers within the footprint coverages of both satellites.

The TRW Space & Electronics Group, with headquarters in Redondo Beach, California, is part of TRW, Inc., an international company headquartered in Cleveland, Ohio. Founded in 1901, the company employs more than 64,000 people working in more than twenty countries. In the latest Fortune 500 directory of American industrial corporations, TRW ranked 64th in

*TDRS-Pacific Beam
Coverage from
174 degrees
West Longitude*

Maximum EIRP at	
beam center:	36.2 dBW
1st contour:	34.2 dBW
2nd contour:	32.2 dBW
3rd contour:	30.2 dBW
4th contour:	28.2 dBW
5th contour:	26.2 dBW
6th contour:	16.2 dBW



sales. The company's sales in 1992 exceeded US\$ 8.3 billion.

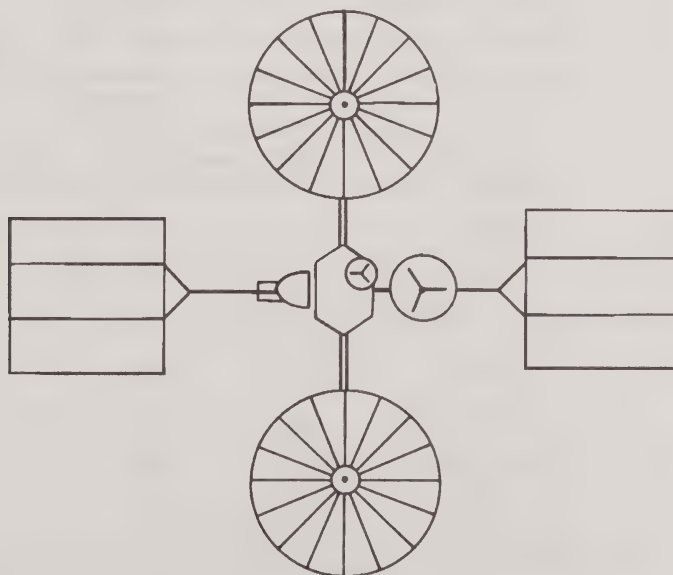
The TDRS-Pacific transponders can provide video, data, and private line telecommunications services between the contiguous United States and all major population centers of Asia, from Hong Kong on North. The TDRS-Atlantic satellite reaches all of Europe, including Eastern Europe, Scandinavia, and the Mediterranean. Coverage on the two satellites overlaps in the Central United States, enabling Columbia to provide coverage to the major Northern Hemisphere population centers from Istanbul to across the Atlantic and from the Western United States to the Pacific and Beijing.

TRW Space & Technology Group, which has constructed all of the TDRS satellites on behalf of NASA, also has filed for FCC authorization to launch its own Pacific-based communications satellite, PacifiCom-1, beginning in 1995. The multiple transponder lease with Columbia allows TRW to phase into full PacifiCom service in 1995.

Occasional-Use Time Brokered by GATS/Conus Venture

The TDRS system also serves as the international portion of a new worldwide satellite distribution network jointly formed by Global Access Telecommunications Services (GATS) and Conus Communications. In 1992, GATS and Conus combined their respective transponder agreements in a joint marketing and acquisition venture. Together, the two companies offer access to a total of forty-one satellite transponders, including twenty-four TDRS C-band transponders, thirteen domestic U.S. C-band transponders, and six domestic Ku-band transponders.

TDRS Satellite



Although some TDRS transponders eventually will be leased to full-time users by Columbia Communications or TRW, GATS and Conus will broker the occasional-use time on these satellites.

The agreement has created a common pool of satellite transponders which both companies can draw upon in order to serve their respective clients. GATS and Conus will be able to negotiate future transponder contracts together, ensuring that their clients will have continued access to satellite facilities. Joint marketing efforts aimed at developing new business also are envisioned. In all other respects, GATS and Conus will remain separate companies, with independent operations and control centers.

TDRS Transponder Plan

Tr.	Uplink	Downlink
01	V-5945 MHz	H-3720 MHz
02	V-5985 MHz	H-3760 MHz
03	V-6025 MHz	H-3800 MHz
04	V-6065 MHz	H-3840 MHz
05	V-6105 MHz	H-3880 MHz
06	V-6145 MHz	H-3920 MHz
07	V-6185 MHz	H-3960 MHz
08	V-6225 MHz	H-4000 MHz
09	V-6265 MHz	H-4040 MHz
10	V-6305 MHz	H-4080 MHz
11	V-6345 MHz	H-4120 MHz
12	V-6385 MHz	H-4160 MHz

Key City	Elevation Angle (est.)	Transmit	Antenna Diameter (meters)
		G/T (dB/K)	
Denver	8.0	-4.9	6.5
Las Vegas	17.0	-5.9	6.5
Los Angeles	20.5	-6.9	6.5
San Francisco	22.0	-4.4	5.5
Seattle	17.5	-3.4	5.5
Beijing	8.0	-6.9	6.5
Hong Kong	9.0	-11.9	15.0
Seoul	17.0	-5.9	6.5
Shanghai	14.0	-6.9	6.5
Taipei	17.0	-9.9	11.0
Tokyo	27.5	-5.9	6.5

Key City	Elevation Angle (est.)	EIRP	Receive Antenna Diameter (meters) for C/(N+1):	
			-16dB	-12dB
Denver	8.0	30.9	9.0	5.5
Las Vegas	17.0	30.9	9.0	5.5
Los Angeles	20.5	29.9	10.0	6.5
San Francisco	22.0	32.8	7.5	4.5
Seattle	17.5	35.4	5.5	3.5
Beijing	8.0	31.9	8.5	5.0
Hong Kong	9.0	26.3	15.0	10.0
Seoul	17.0	32.9	7.5	4.5
Shanghai	14.0	31.9	8.5	5.0
Taipei	17.0	28.9	11.0	7.0
Tokyo	27.5	32.9	7.5	4.5

PacifiCom-1

On August 28, 1991, TRW, Inc., requested FCC authority to launch and operate PacifiCom-1, a hybrid C/Ku-band communications satellite to be located at 172 degrees East Longitude for the provision of international, regional, and foreign domestic Fixed Satellite Service (FSS). They also requested authorization to construct and maintain the corresponding on-ground spare equipment.

In October of 1993, TRW was granted a conditional license from the FCC to construct, launch, and operate the PacifiCom satellite. The satellite will be compatible with most of the currently available commercial launch vehicles—including Delta II, Atlas II, Ariane, Long March, and Proton.

PacifiCom will be a TRW satellite with a mission lifetime of twelve years. The telecommunications payload will include eight active, medium-power C-band transponders, and eleven active, medium-power Ku-band transponders. PacifiCom-1 will provide two-way Ku-band U.S. gateway communications services between Western CONUS and selected Asian nations, and two-way C-band services between Western North America, Asia, and the nations of the South Pacific, including Australia and New Zealand. The Ku-band services on PacifiCom-1 also can be linked from selected countries in Asia, through the use of cross-strapped C-band transponders, to areas within the satellite's broad C-band footprints.

PacifiCom Service Description

PacifiCom-1 also will be used for the provision of foreign domestic and foreign regional satellite communications services. TRW intends to sell or lease the satellite's capacity on a non-common carrier basis, and will retain full responsibility for telemetry, tracking, and control functions.

The services to be provided by PacifiCom's Ku-band frequencies will

include the direct transmission of standard video and high-definition television signals to homes using small receive-only antennas, private VSAT data and voice networks, private computer networks, and video teleconferencing services. At C-band, PacifiCom-1's transponders will be used for commercial television program collection and distribution, as well as for high-speed data communications, including facsimile, two-way video teleconferencing, and wide band digital services. A variety of transponder bandwidths will be provided to enable customers to tailor their use of the satellite's communications capacity to meet their specific service needs.

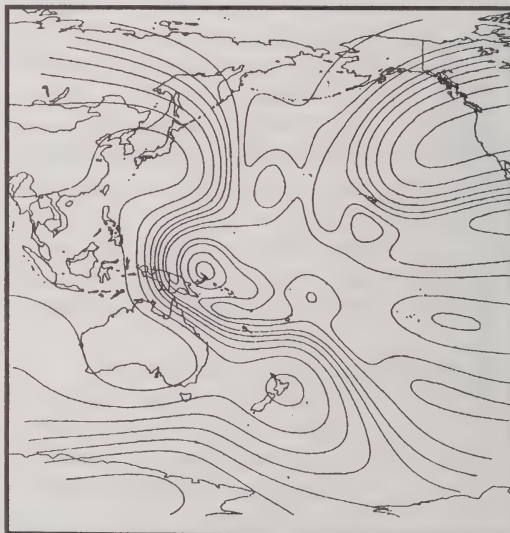
TRW Ground Segment

The ground segment of TRW's PacifiCom system will include a primary Telemetry, Tracking, and Control (TT&C) facility located within the footprint of PacifiCom-1 in the Western United States, most probably in or near the Los Angeles metropolitan area. From this facility, TRW will perform all TT&C functions for the PacifiCom-1 satellite once it is on station at 172 degrees East Longitude.

The ground segment also will include a network of user-owned, leased, or shared C-band and Ku-band earth stations and terrestrial connecting facilities. Various earth stations—including Very Small Aperture Terminals (VSATs), data hubs, and gateways—will be implemented on an ongoing basis and as necessary to meet TRW's expanding service requirements. The system will be accessed directly by its users—the purchasers and lessees of the transponders on PacifiCom-1—through hub earth stations and small terminal earth stations located on or near customer premises. Regional transponder access control earth stations also may be operated in the Pacific Region and/or Asia to coordinate user earth station transmissions.

*PacifiCom-1 Asian
C-band Beam*

Peak EIRP:	37.3 dBW
1st contour:	35.3 dBW
2nd contour:	33.3 dBW
3rd contour:	31.3 dBW
4th contour:	29.3 dBW
5th contour:	27.3 dBW
6th contour:	25.3 dBW
7th contour:	21.3 dBW
8th contour:	17.3 dBW



Future Plans

The PacifiCom-1 application represents only the beginning of TRW's development of a comprehensive Pacific Ocean Region (POR) communications satellite system. PacifiCom-1 will be the first of two collocated spacecraft at the 172 degrees East Longitude orbital location. When TRW achieves its internal business goal of advance leases and transponder capacity sales for PacifiCom-1, the company expects to file an application for a collocated companion satellite at 172 degrees East Longitude—PacifiCom-2—which will be identical to the first except for its use of an opposite polarization format.

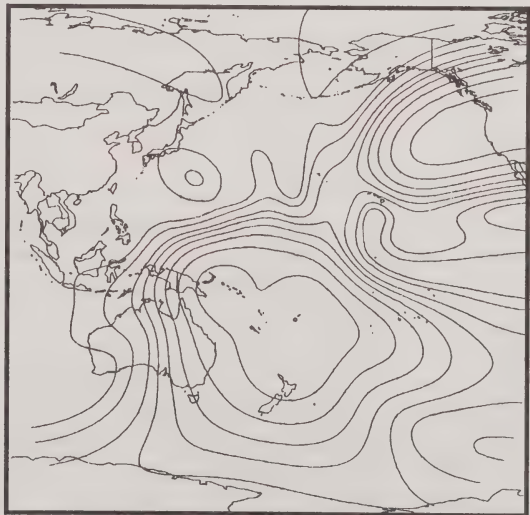
*PacifiCom-1 Asian
North and South
Ku-band Beams*

Peak EIRP:	56.3 dBW
1st contour:	54.3 dBW
2nd contour:	52.3 dBW
3rd contour:	50.3 dBW
4th contour:	48.3 dBW
5th contour:	46.3 dBW
6th contour:	44.3 dBW
7th contour:	40.3 dBW
8th contour:	36.3 dBW



*PacifiCom-1 South Pacific
C-band Beam*

Peak EIRP:	37.7 dBW
1st contour:	35.7 dBW
2nd contour:	33.7 dBW
3rd contour:	31.7 dBW
4th contour:	29.7 dBW
5th contour:	27.7 dBW
6th contour:	25.7 dBW
7th contour:	21.7 dBW
8th contour:	17.7 dBW



FCC Waiver Requested

TRW believes that the use of a smaller satellite is an approach that provides state-of-the-art technical services without sacrificing service quality. Once TRW requests authorization for PacifiCom-2, TRW's two collocated satellites together would be in substantial compliance with the FCC's full frequency re-use requirements for both Ku-band and C-band. As a result, TRW has requested only an interim waiver of these requirements in order to allow time for the company to implement its incremental approach to the provision of Pacific satellite services. Since there are no pending applications or proposals by U.S. firms for the use of 172 degrees East Longitude, TRW would be using a resource that otherwise would go unused.

PacifiCom-1 at a Glance

Operational History

Orbital Assignment :	172 degrees East Longitude
Launch Date(s):	To be determined
Launch Vehicle:	To be determined
Status:	Granted conditional FCC approval
Design Life:	12 years

Communications Payload

Frequency Band(s):	Receive:	14.000~14.500 GHz (Asia and Western CONUS)
		5.925~6.425 GHz (All zones)
	Transmit:	12.2~12.7 GHz (Asia)
		11.7~12.2GHz (Western CONUS)
		3.7~4.2 GHz (All zones)
Channels:	11 Ku-band channels: (5 x 72 MHz, 2 x 54 MHz, and 4 x 27 MHz)	
	8 C-band channels: (1 x 72 MHz, 5 x 54 MHz, and 2 x 36 MHz)	
Polarization:	Ku-band:	LHCP/Up and RHCP/Down
	C-band:	Horizontal/Up & Vertical/Down
Signal Power (EIRP):	Ku-band:	56.5 dBW (Asia)
		52.2 dBW (Western CONUS)
	C-band:	37.7 dBW (All zones)
Uplink G/T:	Ku-band:	13.7 dB/K
	C-band:	-4.5 dB/K
Coverage Area:	Ku-band:	Western CONUS, Asia
	C-band:	South Pacific, Asia, & U.S. West Coast
TWTA Power:	Ku-band:	10 x 30 watts & 1 x 55 watts
SSPA Power:	C-band:	8 x 30 watts

Spacecraft

Satellite Type:	TRW three-axis stabilized
On-Station Weight:	992kg (2,120 lb) on station
Electrical Power:	3,400 watts at beginning of life
Telemetry Beacon:	12.192 GHz
Command Beacon:	14.492 GHz

Chapter Ten: A Tale of Two Satellites— Thaicom-1 & DBS-1

by Mark Long

On the night of December 17, 1993, a shining star in the skies over French Guiana heralded a new world order in satellite broadcasting.

In ancient times, astrologers looked to the skies for heavenly signs announcing earth-shaking events to come. On the evening of December 17, 1993, observers from around the world once again gazed into the heavens, this time seeking a sign that would herald the arrival of a new world order in satellite broadcasting.

Joining more than 100 guests and journalists at the Guiana Space Center near Kourou, French Guiana, I looked across the four kilometers which separated my seat at the outdoor Toucan Observation Center from the Ariane ELA-2 launch pad. As the countdown progressed, there was a palpable sense of the crowd holding its breath. When the moment of ignition finally arrived, the earth trembled and the rockets roared as a five-pointed star of blazing fire hurtled into the heavens.

In the minutes following the lift-off, each of the three main stages of the Ariane 44LP launch vehicle dropped off in succession, leaving only the top nose cone, or "fairing," which contains the two satellites. At the end of the initial launch phase, the fairing was jettisoned and DBS-1— followed soon thereafter by Thaicom-1—began the long journey into geosynchronous orbit.

In remarks following the launch, Harold McDonnell, Vice President of Space Systems Acquisition for Hughes Space and Communications, Inc., characterized the mission as the single most important event in the history of DirecTV's efforts to make high-powered, direct-to-home satellite broadcasting a reality in North America. Arianespace Chairman and Chief Executive Officer Charles Bigot welcomed Thailand as the world's newest member of the community of space-faring nations.

Her Royal Highness, Princess Maha Chakri Sirindhorn of Thailand—the honored guest of Arianespace for the launch—said that the world of today is a World of Communication and the creation of this national space technology project was needed to help her nation catch up with other

developed countries. Dr. Thaksin Shinawatra—Chairman of the Shinawatra Group which has the government concession to operate the Thaicom satellite—said that he had dreamed of being Thailand's satellite operator ever since his company entered the local telecommunications business four years ago. Dr. Thaksin sees the Thaicom National Project as a way to help those who live in remote areas to have greater educational opportunities, to improve their lifestyles.

A Bond Between Satellites

Beyond their joint launch on the same Ariane 44LP rocket, these two communications satellites share other common bonds. For example, both spacecraft were built by Hughes Aircraft Company of El Segundo, California, and represent the 100th and 101st Hughes-designed satellites to be launched in the past thirty years. Both satellite operators plan to launch a second satellite in mid-1994 which will be collocated at the same orbital positions as their sister spacecraft. Moreover, the two follow-on satellites will likely be launched on the same Ariane mission. Finally, DBS-1 and Thaicom-1 will be the first two satellites specifically designed to transmit direct-to-home satellite TV services using a digitally-compressed format. Consequently, their performance inevitably will face a high level of scrutiny, with their technical and economic success—or failure—carefully weighed by competitors and critics alike.

Compression: The Enabling Technology

The worldwide MPEG-2 (Motion Pictures Expert Group) digital video compression standard is *the* enabling technology for both the DirecTv and Thaicom Direct Broadcast Satellite (DBS) programs. Through digital compression, a single satellite transponder can carry four or more direct-to-home TV services, rather than a single conventional analog TV transmission.

MPEG-2 can deliver near laser-disc quality video and CD-quality audio—major improvements over existing direct-to-home satellite TV services. What is more, the MPEG-2 system has ample capacity to accommodate data channels which can provide auxiliary consumer-oriented services, such as an innovative on-screen menu that guides subscribers through the program selections and system operation; programmable subscriber spending and program rating limits; interactive video game tournaments; and home shopping purchase selection. Best of all, MPEG-2 is fully compatible with High Definition Television (HDTV) and wide-screen “CinemaScope” TV broadcasts.

The Thaicom Satellite System

The Thaicom satellite system is operated by Shinawatra Satellite Public Company, Ltd., of Bangkok, Thailand—a unit of Shinawatra Computer and Communications Company, Ltd., established “to build, transfer, and operate” Thailand's domestic satellite system. On September 11, 1991, Shinawatra

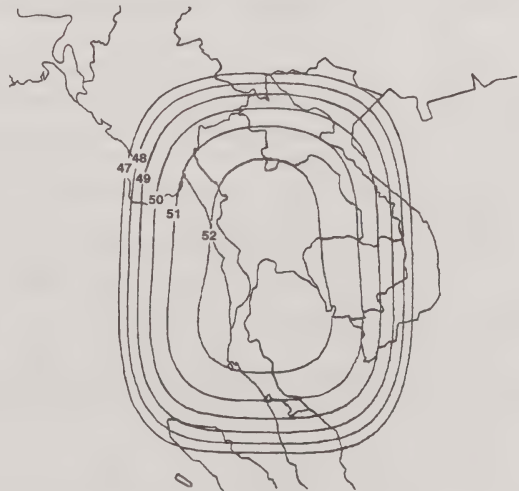
signed a thirty-year concession contract with the Thai Government. On October 8, 1991, Shinawatra signed a US\$ 100 million contract with Hughes Communications International for the construction of two lightweight versions of the successful Hughes HS-376 spin-stabilized platform. The contract also included ground equipment and training of Shinawatra employees to be satellite controllers.

On December 17, 1991, His Majesty King Bhumiphol officially named the satellite system "Thaicom", symbolizing the link between Thailand and modern communications technology. In her pre-launch remarks to the press, Dr. Nongluck, General Manager of Shinawatra Satellite, pointed out that, by an unplanned event in synchronicity, the launch of Thaicom-1 would come exactly two years to the day after The King named the satellite.

According to Dr. Nongluck, the Thai Government has granted Shinawatra exclusivity for the first eight years of its thirty-year concession period, meaning that all Thai Government agencies and private businesses using satellites would be required to use Thaicom. Moreover, all capacity on the first satellite already has been booked, as well as twenty percent of the capacity on the second satellite to be launched in mid-1994. Because of the high rate of early bookings, Shinawatra signed an option agreement with Hughes on November 1, 1993, for a third Thaicom satellite.

Each Thaicom satellite has two Ku-band transponders powered by 47-watt amplifiers which can generate an Effective Isotropic Radiated Power (EIRP) over Thailand of 50 dBW. Each spacecraft also carries ten C-band transponders linked to 11-watt amplifiers, generating an EIRP ranging from 33 to 38 dBW within a broader coverage area stretching from Japan to Singapore. Because of Thaicom's relatively light electronics payload, each satellite will carry several years' worth of additional fuel, thereby achieving a nominal mission lifetime of 14.5 years, versus the typical eight to ten years achieved by other HS-376 models with more transponders. Both Thaicom-1 and Thaicom-2 will be collocated at 78.5 degrees East Longitude.

Viewing the launch from the control room of the Thaicom Satellite Station in Bangkok, Dr. Avudh Ploysongsang, Senior Manager of the Commercial Department at Shinawatra Satellite, set forth a timetable for Thaicom during the weeks ahead. He said:



*Thaicom Ku-band coverage from
78.5 degrees East Longitude*

*Thaicom C-band coverage from
78.5 degrees East Longitude*

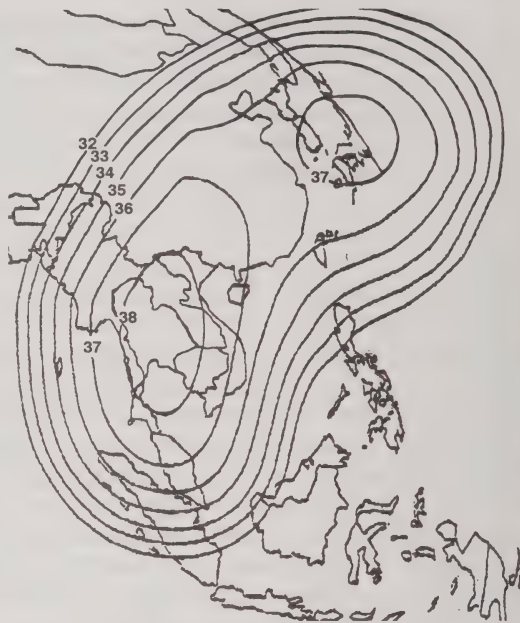
"It will take another two weeks for the satellite to be inserted into the correct [orbital] slot. I predict that, from February 1, 1994, Thaicom will be ready to provide services to its clients. As of today, there are many applications for services through Thaicom....Compunet will be the first client to sign a contract within the next few days...."

Compunet is one of four VSAT business telecommunications operators currently operating in Thailand. Other Thaicom customers will include the five commercial Thai TV broadcasting channels (3, 5, 7, 11, & 13), Shinawatra's new direct-to-home broadcasting service, and Thailand's Telecom Authorities and government agencies. Shinawatra Satellite also expects that Thai private enterprise services will be expanding their satellite usage in the near future.

At the **Satellite TV Asia '93** conference held in Phuket, Thailand, in October of 1993, Dr. Avudh indicated that a major goal of Shinawatra Satellite would be the provision of international satellite communications services. Thaicom's wide C-band coverage beam has been expressly designed to relay foreign domestic and/or regional services on behalf of foreign clients. He further added:

"Laos and Cambodia will be using our satellites. We already have reached an agreement with the governments of both countries to provide them with telecommunications services."

For the vast majority of the Thai people, however, the most visible role for Thaicom-1 will be the direct-to-home transmission of TV signals to tiny 60cm receiving antennas. The Shinawatra Group already owns IBC, a Bangkok-based MMDS programmer with more than 80,000 subscribers. Thaicom will make it possible for IBC to economically expand beyond the Bangkok area, effectively reaching the homes of people who otherwise would not be able to access subscription TV programming. Recent reports indicate that Thaicom's Ku-band transponders will be used to transmit up to ten subscription TV channels and as many as six educational TV services.



Direct-To-Home from DirecTv

DirecTv, a unit of GM Hughes Electronics, is North America's first high-power DBS operator. Based on its extensive marketing research, DirecTv expects to acquire one million paid subscribers by the end of its first year of operations and approximately ten million subscribers by the year 2000.

In April of 1994, DirecTv will begin transmitting approximately seventy-five channels of entertainment and informational programming to subscribers throughout North America. DirecTv will operate eleven of sixteen transponders on DBS-1, with the remaining five transponders operated by United States Satellite Broadcasting (USSB). A second satellite, DBS-2, is scheduled to be launched in mid-1994. DirecTv will operate all sixteen transponders on the second spacecraft. With the collocation of DBS-1 and DBS-2 at 101 degrees West Longitude in mid-1994, approximately 150 channels of programming will become available from a single orbital position.

DirecTv's programming will be received by the DSS™ Digital Satellite System, manufactured by Thomson Consumer Electronics under the RCA brand name. The DSS system consists of an eighteen-inch satellite antenna, a decoder with a security "smart card", and a remote control, all selling for approximately US\$ 700 at electronics retail stores, satellite TV dealerships, and NRTC franchise members and affiliates. The use of such tiny antennas is possible because each DBS satellite carries sixteen 120-watt transponders, approximately three to five times the power provided by any other operational North American communications satellite.

DirecTv's Future Plans

During the pre-launch press briefing, Hughes Vice President Harold McDonnell noted that DirecTv eventually would launch and collocate two additional satellites, DBS-3 and DBS-4, at a second FCC-assigned orbital position of 157 degrees West Longitude. He also confirmed that parts for the third satellite already are being fabricated at the Hughes Aircraft facility in El Segundo, California.

With four DBS satellites in orbit, DirecTv would have the option of connecting two 120-watt amplifiers to each operational transponder in its system, effectively doubling signal levels on the ground. If other U.S. DBS applicants eventually launch competing systems into adjacent DBS orbital slots, DirecTv could use this system performance booster as an edge against the competition. A ten-inch satellite dish could also be used to receive DirecTv programming in many areas of the country—especially in Western states where rain attenuation is not a significant problem.

Rain attenuation—the loss of signal due to absorption and thermal noise accompanying heavy rainfall—requires receiving system designers to include a margin of several dB C/N into the downlink budget for any Ku-band satellite receiving system. This margin is obtained by increasing the diameter of the receiving antenna.

In an exclusive interview held with Thomas Bracken, Vice President at DirecTv, the company's future plans were further clarified:

"We are setting up a new digital data stream into the home, a digital pipeline. In addition to video, we will be able to deliver new data services such as stock market reports, weather reports, games, and potentially we can download computer software to a storage device. It just opens up a whole world of digital transmission which means computer data and possibly interactive services down the road. So this is a whole new world we are entering, all available through this eighteen-inch satellite dish."

United States Satellite Broadcasting

Sharing DBS-1 capacity with DirecTv is United States Satellite Broadcasting (USSB), a competing direct-to-home satellite TV programmer based in Minneapolis, Minnesota. The decision on the part of DirecTv and USSB to share a satellite and common operating technologies represents an unusual partnership. In a one-on-one interview held last summer during the national SBCA convention, I asked USSB founder Stanley Hubbard to explain:

"We needed each other. The General Motors Board told Hughes that, if they wanted to launch a direct broadcast satellite, [then they must] go out and find a partner.... We were unable to raise enough money to buy a satellite by ourselves, but we had enough to satisfy that Hughes/General Motors need and we came together...in the same way that TV station operators build a terrestrial TV tower together. It is cost effective—good for them, good for us, and good for the public, because there will be competition for different program services."

DirecTv's Thomas Bracken also stressed cooperative over competitive aspects in connection with the relationship between the two companies.

"This is a very expensive enterprise, close to a one-billion dollar investment on the part of the different companies involved.... We are bringing our capital resources together in order to launch this together. The consumer will benefit because...it will give them more choice and a broader variety of programming."

Accolades For Arianespace

During the past several years, Arianespace has established itself as the world's premiere launch provider. In 1993 alone, Arianespace successfully completed seven launches, including five during the last six months of the year, and two within a twenty-nine day period. At the time of writing, Arianespace had a waiting list of thirty-five satellites to be launched during the next three years, including seven commercial communications satellites from North America, six from INTELSAT, five from Europe, and five from Asia. The total value of these future launches exceeds US\$ 2.6 billion.

Arianespace is a privately-owned multinational organization with more than fifty shareholders in a dozen European countries, including leading European aerospace and electronics corporations, thirteen major European

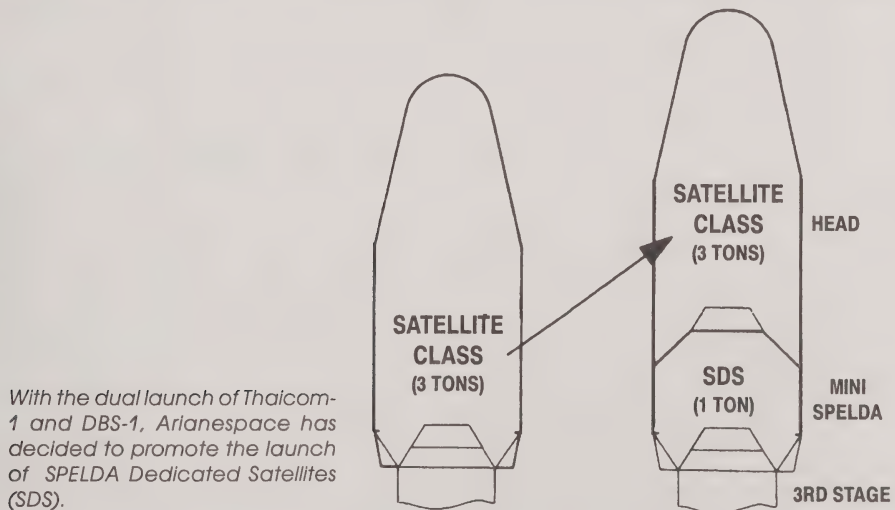
banks, and the French space agency CNES (Centre National d'Etudes Spatiales). The organization was established in 1980, when the European Space Agency (ESA) decided to entrust to Arianespace the commercialization, production, and launching of operational launch vehicles. The ESA continues to undertake development programs for enhanced versions of the Ariane launcher, including the upcoming Ariane 5 with its new HM60/Vulcain engine.

Arianespace uses the launch facilities of CNES located near Kourou, French Guiana. The site is strategic because of its relative closeness to the equator, allowing launches to save fuel. It is also cyclone and earthquake-free, offers extensive launch azimuth possibilities, and has a low population density.

Today's Ariane 4 launch vehicle, which can inject masses of 1.9 to 4.2 tons into geostationary transfer orbit, is available in four configurations: Ariane 42P, with two solid propellant boosters; Ariane 42L, with two liquid fuel propellant boosters; Ariane 44P, with four solid propellant strap-on boosters; and Ariane 44L, with four liquid propellant boosters. Since the demonstration flight of the first Ariane 4 launch vehicle in 1988, Ariane has achieved a launch success rate of more than ninety-six percent. During this timespan, no other company has achieved comparable results.

Another aspect in which Arianespace has shown innovation is in the use of SPELDA—a bearing structure located inside the launch vehicle's fairing, which can accommodate dual-satellite payloads. Ariane's use of SPELDA both reduces the launch cost per satellite and increases the launch opportunities for customers.

With the successful dual launch of DBS-1 and Thaicom-1, Arianespace is now promoting the launch of new SDS (SPELDA Dedicated Satellite) class satellites, which have a weight of approximately one metric ton. As most of

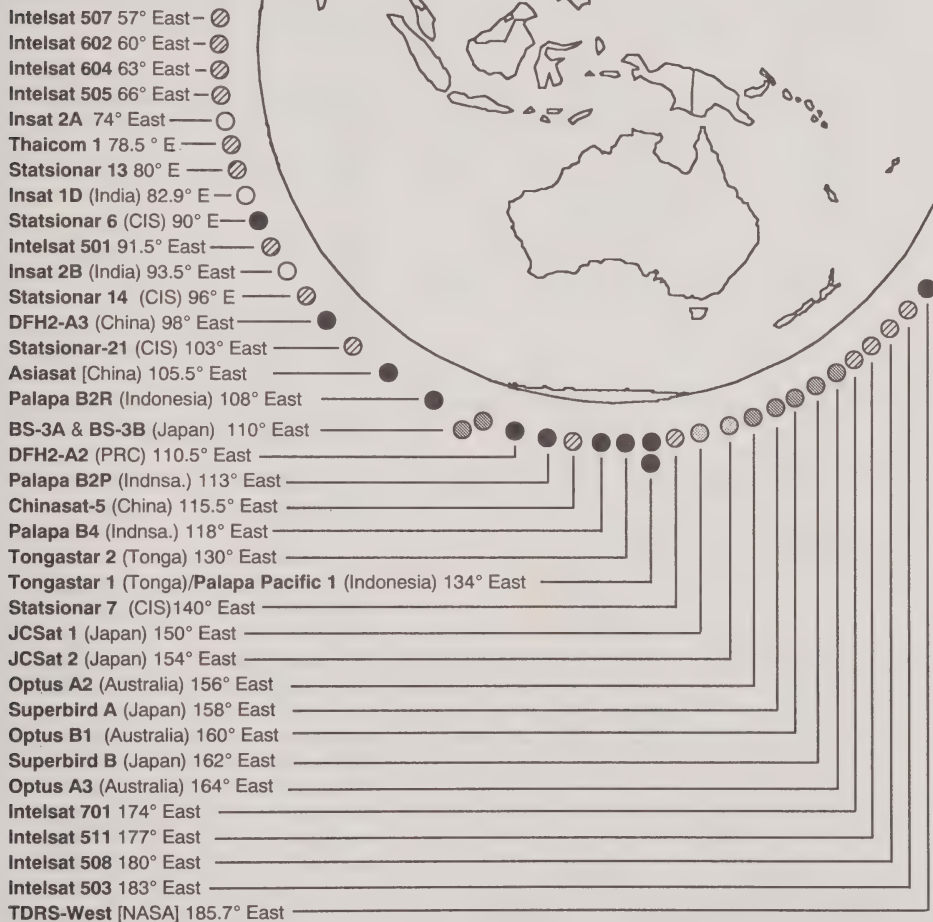


Arianespace's future launches over the next three years involve satellites with a metric weight of about 3 tons, SDS-class satellites could be added to these missions at a fraction of the cost of a dedicated launch. SDS-class satellites should be attractive to both new domestic satellite operators wishing to emulate Thailand and existing satellite operators who may need to build and launch a satellite within a short time, to replace defective in-orbit capacity or fulfill an unanticipated surge in demand.

The next-generation Ariane 5 launch vehicle will feature a greater mass lift weight (6.2 tons), a higher level of reliability, a reduced cost per launch vehicle, and the ability to launch manned vehicles such as the Hermès space plane under consideration by the European Space Agency. A new ELA-3 launch complex currently is under construction to handle future Ariane 5 missions. The first Ariane 5 demonstration flight is planned for mid-1995. Arianespace intends to begin providing commercial Ariane 5 launches at the rate of three to four per year beginning in 1996. By 1999, the organization will be ready to make the decision whether to switch over totally to the Ariane 5 or continue to offer both the Ariane 4 and Ariane 5 launch vehicles to their customers.

Chapter Eleven: TV & Radio Satellites (ITU Region 3)

- ⊙ = Ku-/Ka-band
- = C-band only
- ⊗ = C-/Ku-band
- ⊕ = UHF only
- ⦿ = Ku-band only
- = C/S band



Sat.	Orbit	Tr.#	Beam	Pol/Freq	BW	Service/ Description	Audio Subcarrier	Beam Center EIRP
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INTERNATIONAL, REGIONAL, & DOMESTIC SATELLITES SERVING THE INTERNATIONAL TELECOMMUNICATION UNION (ITU) REGION 3

INTELSAT V & VA SATELLITES AT 183°, 180°, 177°, & 174° EAST

I-503	183 E	71	ES	V-10.975	30	TV Tokyo	5.8/6.8 MHz	44 dBW
I-503	183 E	71	ES	V-11.015	30	Nihon TV Net/Tokyo (NBC News in off-hours)	5.8/6.8 MHz	44 dBW
I-503	183 E	79	ES	V-11.510	30	TV Asahi (CNN domestic encrypted in off-hours)	6.8 MHz	44 dBW
I-508	180 E	11[1]	WH	RH-3.720	27	ESPN Int.—U.S. [Encrypted—B-MAC]	B-MAC	29 dBW
I-508	180 E	41[1]	NW/ Z	LH-3.725	36	CNBC—U.S. (Feed to Wharf Cable in Hong Kong)	6.6 MHz	29 dBW
I-508	180 E	11[3]	WH	RH-3.765	36	LA to Network 10 Aust. & TV3 New Zealand Including CNN, CNBC & NHK's "Japan Today"	6.6 MHz	28 dBW
I-508	180 E	42[7]	WH	LH-3.840	36	Occasional Video K2 SKYLINK [KDD/Keystone]	6.65 MHz	29 dBW
I-508	180 E	12[7]	WH	RH-3.845	36	CNN International CNN Headline News	6.65 MHz 6.3 MHz	29 dBW
I-508	180 E	13[09]	WH	RH-3.876	20	NBC/CNBC to Ch. 7 Aust. Vidiplex Frame A: NBC Vidiplex Frame B: CNBC	5.58 MHz 5.73 MHz	26 dBW
I-508	180 E	13[10]	WH	RH-3.894	20	Occasional Video CNBC, CNN, BBC, etc. to ABC Australia	5.76/6.6 MHz	26 dBW
I-508	180 E	13[12]	WH	RH-3.930	20	LA to Channel 9 Aust. Vidiplex Frame A: ABC Vidiplex Frame B: CBS Radio Service: Auxiliary 1: Auxiliary 2:	6.65 MHz 6.12 MHz 6.30 MHz 5.6025 MHz 5.7375 MHz 5.4175 MHz	26 dBW

Sat.	Orbit	Tr.#	Beam	Pol/Freq	BW	Service/ Description	Audio Subcarrier	Beam Center EIRP
I-508	180 E	14[14]	WH	RH-3.975	36	Worldnet/CSPAN/ Deutsche Welle TV VOA English & Spanish VOA French & Spanish VOA Vietnam & Tibet VOA Laos, Korea VOA Chinese VOA English	6.65 MHz 6.65 MHz 7.02 MHz 7.20 MHz 7.35 MHz 7.45 MHz 7.53 MHz 7.60 MHz	29 dBW
I-508	180 E	44(13)	G	RH-4.015	22	NHK/TV Tokyo/ABC	6.6/7.5 MHz	25 dBW
I-508	180 E	35[18]	G	RH-4.045	20	RFO France TV (for Tahiti in SECAM)	6.65 MHz	29 dBW
I-508	180 E	37[22]	G	RH-4.135	20	Nine Network Aust. [PAL]	6.65 MHz	25 dBW
I-508	180 E	38[23]	G	RH-4.166	20	Occasional Video- TVNZ-1 News feeds	6.65 MHz	22 dBW
I-508	180 E	38[24]	G	RH-4.188	20	Occasional Video- TVNZ-2 News and Sports Feeds including BBC/Sky/ WTN News to the Pacific	6.65 MHz	22 dBW
I-508	180 E	79	ES	V-11.480	30	TBS (CBS/EBN/off hours) [Tokyo Broadcasting System]	5.8/6.8 MHz	44 dBW
I-508	180 E	79	ES	V-11.510	30	Fuji TV (ABC/off hours)	5.8/6.8 MHz	44 dBW
I-511	177 E	88[22]	G	LH-4.177	27	AFRTS-Pacific [Encrypted—B-MAC] Auxiliary services: AFRTS Radio	B-MAC 7.4 MHz	25 dBW
I-511	177 E	38[23]	G	RH-4.166	20	Occasional Video Fuji TV, etc.	6.6 MHz	25 dBW
I-511	177 E	38[24]	G	RH-4.187	20	Occasional Video TTV Taiwan, etc.	6.65 MHz	25 dBW
I-510	174 E	38[23] 38[24]	G	RH-4.166 RH-4.187	20 20	Occasional Video- CCTV to NHK, SCOLA, etc.	6.6/6.65 MHz	23 dBW

Sat.	Orbit	Tr.#	Beam	Pol/Freq	BW	Service/ Description	Audio Subcarrier	Beam Center EIRP
OPTUS A2 (AUSTRALIA) - 164° EAST								
Optus A2 has been placed into an inclined orbit to extend its operational lifetime. At the time of writing, the satellite was carrying only voice and data traffic on behalf of Optus Communications.								
SUPERBIRD B & SUPERBIRD A (SCC—JAPAN) - 162° & 158° EAST								
SCC-B	162 E	—	S	H-12.210	27	Color Bars	PCM	53 dBW
SCC-B	162 E	—	S	V-12.290	27	TV Tepco [Tokyo Electric Power Co.]	PCM	53 dBW
SCC-B	162 E	01	S	V-12.370	27	Fanky Banana Ch. [SKYPORT Encrypted]	PCM	53 dBW
SCC-B	162 E	11	S	H-12.390	27	Universal One TV [Moonies Religious]	PCM	53 dBW
SCC-B	162 E	02	S	V-12.410	27	Cable Soft Network [SKYPORT Encrypted]	PCM	53 dBW
SCC-B	162 E	12	S	H-12.430	27	CTV [Chinese]	PCM	53 dBW
SCC-B	162 E	03	S	V-12.450	27	Super Channel [Skyport Encrypted] Weather Channel	PCM PCM—Audio Only	53 dBW
SCC-B	162 E	04	S	V-12.490	27	Nihon Cable TV Net. [Encrypted—Skyport System]	PCM	53 dBW
SCC-B	162 E	05	S	V-12.530	27	Life Design Channel [Skyport Encrypted]	PCM	53 dBW
SCC-B	162 E	15	S	H-12.550	27	Orient Satellite Broadcasting (Korean Program)	PCM	53 dBW
SCC-B	162 E	06	S	V-12.570	27	Space Vision Netork [Skyport Encrypted]	PCM	53 dBW
SCC-B	162 E	07	S	V-12.610	27	Asahi New Star	PCM	53 dBW
SCC-B	162 E	08	S	V-12.650	27	Japan Cable Television [CNN Relay/Encrypted—Skyport System]	PCM	53 dBW
SCC-B	162 E	09	S	V-12.690	27	Music Channel [MTV Japan/Encrypted—Skyport System]	PCM	53 dBW
SCC-B	162 E	10	S	V-12.730	27	Star Channel [Encrypted—Skyport System]	PCM	53 dBW

Sat.	Orbit	Tr.#	Beam	Pol/Freq	BW	Service/ Description	Audio Subcarrier	Beam Center EIRP
SCC-A	158 E	02-A	S	H-12.300	27	Tokyo Broadcasting System (TBS)—SNG Channel	5.75/6.2 MHz	47 dBW
SCC-A	158 E	02-B	S	H-12.320	27	Tokyo Broadcasting System (TBS)—SNG Channel	5.75/6.2 MHz	47 dBW
SCC-A	158 E	03	S	H-12.350	27	Nihon TV Network —SNG Channel	5.75/6.2 MHz	47 dBW
SCC-A	158 E	05-A	S	H-12.380	27	Fuji TV Network	5.8/6.2 MHz	47 dBW
SCC-A	158 E	05-B	S	H-12.400	27	Fuji TV Network	5.8/6.2 MHz	47 dBW
SCC-A	158 E	6	S	H-12.520	27	TV Tepco (Tokyo Electric Power Co., Ltd.)	5.75/6.2 MHz	47 dBW
SCC-A	158 E	13	S	V-12.570	27	Color Bars	6.2 MHz	47 dBW

OPTUS B1 & A3 (AUSTRALIA) - 160° & 156° EAST

B1	160 E	01	N/SE	V-12.277	54	Data (incl. Arnsat) (Aust. Radio Network Satellite)		49 dBW
B1	160 E	03-L	NB	V-12.389	36	Network News Feeds [PAL/NTSC]		42 dBW
B1	160 E	03-U	NB	V-12.421	36	7 Network (SPS) [Encrypted—E-PAL/VAMP] Order wire channels: [Wegener]	7.38/7.56 MHz	42 dBW
B1	160 E	04-L	NB	V-12.453	27	Network 10 Int. Interchange News/Promo	7.38/7.56 MHz	38 dBW
B1	160 E	04-U	NB	V-12.485	27	Network 10 [Encrypted—E-PAL]	7.38/7.56 MHz	38 dBW
B1	160 E	05	SE	V-12.533	27	SBS—Specialized Broadcast Service [Encrypted—B-MAC] Radio 2EO (Sydney) Radio 3EO (Melbourne) MAC-Text: reception hints	B-MAC Ethnic TV Programs	49 dBW
B1	160 E	06	NB	V-12.597	27	Sky TV [Encrypted—B-MAC] Omnicast Radio	B-MAC	49 dBW

Sat.	Orbit	Tr.#	Beam	Pol/Freq	BW	Service/ Description	Audio Subcarrier	Beam Center EIRP
B1	160 E	07	SE	V-12.661	27	ABC HACBSS [Encrypted—B-MAC] DBS TV Service Auxiliary Services: ABC National Radio ABC Regional Radio ABC Teletext	B-MAC with Stereo audio	49 dBW
B1	160 E	08	N/SE	V-12.725	27 36	Sky Special Event/ 9 Network [PAL/NTSC]	B-MAC 7.38/7.56 MHz	49 dBW
B1	160 E	09	NB	H-12.309	54	Data Services		
B1	160 E	10	NB	H-12.373	43	Rural Doctor's Satellite Network [PAL]	7.38/7.56	45 dBW
B1	160 E	11	NE	H-12.436	36	TV Oceania [Japanese Tourist Channel]	Videocrypt	49 dBW
B1	160 E	13-L	NB	H-12.548	27	ABC TV International	B-MAC	38 dBW
B1	160 E	13-U	NB	H-12.581	27	Data Services		
B1	160 E	14	NE	H-12.629	27	ABC TV - HACBSS [Encrypted—B-MAC] Queensland DBS Service Auxiliary Services: ABC National & Regional Radio Services ABC Teletext	B-MAC (Stereo)	49 dBW
B1	160 E	15	NE	H-12.693	27	RCTS: QSTV [Queensland Satellite TV] (Stereo) [Encrypted—B-MAC] Regional DBS TV Service Auxiliary services: MAC-Text TV Guide	B-MAC	49 dBW
A3	156 E	01	NA	V-12.277	36	Occasional Video- [CSIRO/OPTUS: PAL—Clear]	6.6/6.65 MHz	38 dBW
A3	156 E	02	WA	V-12.341	27	Golden West Network [Encrypted—B-MAC] Regional DBS TV Service Auxiliary Services: Perth Rock Radio Teletext: TV Guide	B-MAC with Stereo audio 96 FM Stereo	50 dBW
A3	156 E	03	NA	V-12.405	36	Voice & Data Services/Department of Defense		
A3	156 E	04	NA	V-12.469	43	Data Services		

Sat.	Orbit	Tr.#	Beam	Pol/Freq	BW	Service/ Description	Audio Subcarrier	Beam Center EIRP
A3	156 E	05	SE	V-12.533	36	Occasional Video Enterprise Channel	B-MAC	44 dBW
A3	156 E	06	NA	V-12.597	43	Data Services		
A3	156 E	07	WA	V-12.661	27	Enterprise Channel/ TV Oceania	B-MAC [PAL]	50 dBW
A3	156 E	08	WA	V-12.725	27	ABC HACBSS [Encrypted—B-MAC] DBS TV Service Auxiliary Services: ABC National & Regional Radio Services ABC Teletext	B-MAC with Stereo audio	50 dBW
A3	156 E	09	NB	H-12.309	43	Department of Aviation (3) Data Service		
A3	156 E	10	NB	H-12.373	43	Department of Aviation (4) Data Service		
A3	156 E	11	NE	H-12.436	27	TV Oceaniana/ TSN 11	Videocrypt B-MAC	50 dBW
A3	156 E	12	CA	H-12.501	27	ABC HACBSS [Encrypted—B-MAC] DBS TV Service Auxiliary Services: ABC National & Regional Radio Services ABC Teletext	B-MAC with Stereo audio	50 dBW
A3	156 E	13	NB	H-12.565	43	Telecom 1/[ITERRA] Audio & Data Services	SCPC	
A3	156 E	14	CA	H-12.629	27	RCTS: Imparja— ("Foot From the Sky") [Encrypted—B-MAC] Aboriginal DBS TV Service Auxiliary Services: Aboriginal Radio MAC-Text: TV Guide	B-MAC with Stereo audio	50 dBW
A3	156 E	15	CA	H-12.693	27	ABC HACBSS [Encrypted—B-MAC] DBS TV Service Auxiliary Services: ABC National & Regional Radio Services ABC Teletext	B-MAC with Stereo audio	50 dBW

Sat.	Orbit	Tr.#	Beam	Pol/Freq	BW	Service/ Description	Audio Subcarrier	Beam Center EIRP
JCSAT 2 & JCSAT 1 (JAPAN) - 154° & 150° EAST								
JCSat-2	154 E	02	S	H-12.283	27	Japan Religious & Japan Leisure Channel Cable TV Access Ch.	PCM 6.2 MHz PCM	53 dBW
JCSat-2	154 E	03	S	V-12.298	27	Midnight Blue/Business News Net. [Encrypted—M System]		53 dBW
JCSat-2	154 E	04	S	H-12.313	27	Nikkei Satellite News	PCM	53 dBW
JCSat-2	154 E	05	S	V-12.328	27	Color Bars "JCSat-2"	6.2 MHz	53 dBW
JCSat-2	154 E	06	S	H-12.343	27	High Tech Shower [Encrypted—M System]	PCM	53 dBW
JCSat-2	154 E	08	S	V-12.388	27	Channel NECO	6.2 MHz	53 dBW
JCSat-2	154 E	10	S	H-12.403	27	Rainbow Channel/ M-Channel (JMTV)	PCM [Encrypted—M System]	53 dBW
JCSat-2	154 E	13	S	V-12.448	27	Kids' Channel/ M-Channel (JMTV)	PCM [Encrypted—M System]	53 dBW
JCSat-2	154 E	16	S	H-12.493	27	Childrens' Channel [Encrypted—B-MAC] Satellite Culture Japan	B-MAC PCM	53 dBW
JCSat-2	154 E	18	S	H-12.523	27	Space Shower TV [COATEC Encrypted]	PCM	53 dBW
JCSat-2	154 E	22	S	H-12.583	27	Japan Sports Channel [COATEC Encrypted]	PCM	53 dBW
JCSat-2	154 E	23	S	V-12.598	27	PCM Zipang Radio Sky—Audio Only [COATEC Encrypted]	PCM PCM	53 dBW
JCSat-2	154 E	24	S	H-12.613	27	Satellite Theater	PCM	53 dBW
JCSat-2	154 E	25	S	V-12.628	27	Music Bird—Audio Only Satellite Music—Audio Only [COATEC Encrypted]	PCM PCM	53 dBW
JCSat-2	154 E	26	S	H-12.643	27	Satellite ABC	PCM	53 dBW
JCSat-1	150 E	02	S	H-12.283	27	Occasional Video News SNG—TV Asahi	6.2 MHz	53 dBW

Sat.	Orbit	Tr.#	Beam	Pol/Freq	BW	Service/ Description	Audio Subcarrier	Beam Center EIRP
JCSat-1	150 E	05	S	V-12.328	27	Color Bars "JCSat 1"	6.2 MHz	53 dBW
JCSat-1	150 E	08	S	H-12.373	27	NHK-SNG	PCM	53 dBW
JCSat-1	150 E	10	S	H-12.403	27	NHK-SNG	PCM	53 dBW
JCSat-1	150 E	15	S	V-12.463	27	P-SAT (MPT-Japan) & Japan Mercantile TV [Encrypted—M System]	PCM	53 dBW

STATSIONAR 7 (C.I.S.) - 140° EAST

Stat. 7	140.0 E	6[-1]	S	RH-3.675	36	Orbita I Radio Mayak	7.0 MHz 7.5 MHz	44 dBW
Stat. 7	140.0 E	10[9]	G	RH-3.875	36	Dub'l 1 Radio Moscow	7.5MHz 7.0 MHz	29 dBW
Stat. 7	140.0 E	—	S	RH-11.526	36	Sakha TV (Service from Yakutsk)	7.0 MHz	

RIMSAT - [TONGA] 130° EAST

R1	134 E	7[1]	S	RH-3.725	36	Sun TV [Tamil language service in PAL]	6.6 MHz	44 dBW
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CHINASAT-5 (CHINA) - 115.5° EAST (Formerly Named Spacenet I)

C5	115.5 E	03[05]	S	H-3.803	36	CCTV-2	6.6 MHz	36 dBW
C5	115.5 E	04[07]	S	H-3.843	36	Xizang TV/ (Tibet) Chinese Radio Service Tibetan Radio Service	6.6 MHz 6.6 MHz 7.1 MHz 7.6 MHz	36 dBW
C5	115.5 E	05[09]	S	H-3.883	36	CCTV-1	6.6 MHz	36 dBW
C5	115.5 E	07[13]	S	H-3.960	36	Sichuang TV Sichuang Radio	6.6 MHz 7.5 MHz	36 dBW

Sat.	Orbit	Tr.#	Beam	Pol/Freq	BW	Service/ Description	Audio Subcarrier	Beam Center EIRP
C5	115.5 E	11[22]	S	H-4.120	36	Xinjiang TV Station	6.6 MHz	36 dBW
C5	115.5 E	12[24]	S	H-4.160	36	CCTV-3	6.6 MHz	36 dBW
PALAPA B4, B2P & B2R (INDONESIA) - 118°, 113° & 108° EAST								
P-B4	118 E	6[3V]	S	V-3.810	20	BBTV Thailand-Ch. 7	6.6 MHz	30 dBW
P-B4	118 E	14[8V]	S	V-3.890	30	EM-TV (PNG)	5.9 MHz	36 dBW
P-B4	118 E	14[8V]	S	V-3.980	30	Army TV Thai.-Ch. 5	6.6 MHz	36 dBW
P-B2P	113 E	5[3H]	S	H-3.800	30	RCTI Indonesia [Rajamari Citra Televisi]	6.6 MHz	34 dBW
P-B2P	113 E	6[3V]	S	V-3.820	30	TV3 (System Televisyan Malaysia)	6.6 MHz	34 dBW
P-B2P	113 E	8[4V]	S	V-3.860	30	Canal France Int. ✓	6.6 MHz	34 dBW
P-B2P	113 E	9[5H]	S	H-3.880	36	ATVI Australia ✓ Stereo (Panda I) Radio Australia	6.8 MHz 6.3/6.48 MHz 7.20 MHz	36 dBW
P-B2P	113 E	10[5V]	S	V-3.900	30	TV1 Malaysia	6.80 MHz	36 dBW
P-B2P	113 E	11[6H]	S	H-3.920	30	Asia Business News	6.80 MHz	36 dBW
P-B2P	113 E	12[6V]	S	V-3.930	30	TV Thailand-Ch. 11 ✓	6.80 MHz	36 dBW
P-B2P	113 E	13[7H]	S	H-3.960	30	ABS/CBN [Philippines]	6.80 MHz	36 dBW
P-B2P	113 E	14[7V]	S	V-3.980	27	CNN International	6.8 MHz	36 dBW
P-B2P	113 E	15[8H]	S	H-4.000	27	HBO Asia [Encrypted—B-MAC]	B-MAC	36 dBW
P-B2P	113 E	16[8V]	S	V-4.020	36	AN-TEVE-Indonesia	6.8 MHz	36 dBW
P-B2P	113 E	17[9H]	S	H-4.030	18	GMA - Philippines	6.8 MHz	30 dBW
P-B2P	113 E	17[9H]	S	H-4.050	18	KBP People's Network - Philippines	6.8 MHz	30 dBW

Sat.	Orbit	Tr.#	Beam	Pol/Freq	BW	Service/ Description	Audio Subcarrier	Beam Center EIRP
P-B2P	113 E	18[9V]	S	V-4.060	36	SCPC—Radio Thailand—7 carriers		
				V-4.0566475		Channel 326	315 kHz BW	
				V-4.0566925		Channel 327	315 kHz BW	
				V-4.0567375		Channel 328	315 kHz BW	
				V-4.0567825		Channel 329	315 kHz BW	
				V-4.0568275		Channel 330	315 kHz BW	
				V-4.0568725		Channel 331	315 kHz BW	
				V-4.0569175		Channel 332	315 kHz BW	
P-B2P	113 E	19[10H]	S	H-4.080	36	TPI-Indonesia [Televisi Pendidikan Indonesia]	6.8 MHz	36 dBW
P-B2P	113 E	20[10V]	S	V-4.100	27	ESPN International [Encrypted—B-MAC]	B-MAC	36 dBW
P-B2P	113 E	21[11H]	S	H-4.120	36	SCTV-Indonesia [Surya Citra Televisi]	6.6 MHz	36 dBW
P-B2P	113 E	22[11V]	S	V-4.140	36	The Gold Network [Nine Network Australia]	6.2/6.8 MHz	36 dBW
P-B2R	108 E	15[8H]	S	H-4.000	30	TVRI-Indonesia [Televisi Republik Indonesia]	6.8 MHz	36 dBW
P-B2R	108 E	21[11V]	S	H-4.120	30	Occ. Video-Indonesia	6.8 MHz	36 dBW
DFH-2 A1 (CHINA) - 110.5° EAST								
DFH-1	110.5 E	24	S	H-3.928	30	CETV 2-China	6.6 MHz	31 dBW
BS-3A & BS-3B (JAPAN) - 110° EAST								
BS-3A	110.0 E	07	S	RH-11.842	27	DBS-1 [Joho]	PCM	55 dBW
BS-3A	110.0 E	11	S	RH-11.919	27	DBS-2 [NHK]	PCM	55 dBW
BS-3B	110.0 E	05	S	RH-11.804	27	Japan Satellite Bct. [Encrypted—COATEC System] Satellite Digital Audio Broadcasting	PCM	52 dBW
BS-3B	110.0 E	09	S	RH-11.880	27	Japan HDTV Tests [NHK MUSE HDTV System]	PCM	52 dBW

Sat.	Orbit	Tr.#	Beam	Pol/Freq	BW	Service/ Description	Audio Subcarrier	Beam Center EIRP
ASIASAT 1 (HONG KONG) - 105.5° EAST								
A1	105.5 E	2H[3]	NB	H-3.760	36	Mongolia Television Mongolia [SECAM]	6.6 MHz	37 dBW
A1	105.5 E	3H[5]	NB	H-3.800	36	Prime Sports [STAR TV - NTSC] Mandarin audio	5.58/5.76 MHz PANDA I stereo 5.94 MHz PANDA I mono	37 dBW
A1	105.5 E	4H[7]	NB	H-3.840	36	MTV Asia [NTSC-M] [STAR TV - NTSC] BBC World Service Radio (1)	5.58/5.76 MHz PANDA I stereo 5.94 MHz PANDA I mono	37 dBW
A1	105.5 E	5H[9]	NB	H-3.880	36	BBC Asia [STAR TV - NTSC] Mandarin audio	5.58/5.76 MHz PANDA I stereo 5.94 MHz PANDA I mono	37 dBW
A1	105.5 E	6H[11]	NB	H-3.920	36	Chinese Channel [STAR TV - NTSC] Mandarin audio BBC World Service Radio (3)	5.58/5.76 MHz PANDA I stereo 6.20 MHz 5.94 MHz PANDA I mono	37 dBW
A1	105.5 E	7H[13]	NB	H-3.960	36	STAR Plus [STAR TV - NTSC] BBC World Service Radio (2)	5.58/5.76 MHz PANDA I stereo 5.94 MHz PANDA I mono	37 dBW
A1	105.5 E	9H[17]	NB	H-4.040	36	Chinese Prov. TV [Guizhou/Yunnan TV] Provincial Radio	6.6 MHz PAL-D 7.5 MHz	37 dBW
A1	105.5 E	11H[21]	NB	H-4.120	36	CCTV 4 [MRFTV—China]	6.2 MHz NTSC	37 dBW
A1	105.5 E	4V[8]	SB	V-3.860	36	Prime Sports [STAR TV - PAL] Mandarin audio	6.3/6.48 MHz PANDA I stereo 7.2 MHz Panda I mono	38 dBW
A1	105.5 E	5V[10]	SB	V-3.900	36	MTV Asia [STAR TV - PAL] BBC World Service Radio (1)	6.3/6.48 MHz PANDA I stereo 7.20 MHz PANDA I mono	38 dBW
A1	105.5 E	6V[12]	SB	V-3.940	36	BBC Asia [STAR TV - PAL] Mandarin audio (mono)	6.3/6.48 MHz PANDA I stereo 7.20 MHz PANDA I mono	38 dBW

Sat.	Orbit	Tr.#	Beam	Pol/Freq	BW	Service/ Description	Audio Subcarrier	Beam Center EIRP
A1	105.5 E	7V[14]	SB	V-3.980	36	Zee TV [STAR TV - PAL] Mandarin audio (mono) BBC World Service Radio (3)	6.3/6.48 MHz PANDA I stereo 6.80 MHz 7.20 MHz PANDA I mono	38 dBW
A1	105.5 E	8V[16]	SB	V-4.020	36	STAR Plus [STAR TV - PAL] BBC World Service Radio (2)	6.3/6.48 MHz PANDA I stereo 7.20 MHz PANDA I mono	38 dBW
A1	105.5 E	9V[18]	SB	V-4.060	36	STAR TV-Chinese Ch.	6.3/6.48 MHz	38 dBW
A1	105.5 E	10V[20]	SB	V-4.100	36	Pakistan TV	6.6 MHz	38 dBW
A1	105.5 E	11V[22]	SB	V-4.140	36	Myanmar TV [Burma]	6.6 MHz NTSC	38 dBW

STATSIONAR 21, 14, T (C.I.S.) - 103°, 96° & 99° EAST

Stat. 21	103.0 E	6 [-1]	G	RH-3.675	36	Dub'1-IV Moscow Radio	7.0 MHz 7.5 MHz	36 dBW
Stat. 21	103.0 E	7 [1]	NH	RH-3.725	36	Muslim TV Ahmadiyya Urdu audio English audio Arabic audio	6.5 MHz 7.0 MHz 7.2 MHz	31 dBW
Stat. 21	103.0 E	10[9]	G	RH-3.875	36	Asia TV Network-One Asia TV Network-Gold	7.5 MHz	29 dBW
Stat. T	99.0 E	UHF	NH	RH-0.714	36	I Programma [Orbita 3]	7.5 MHz	55 dBW
Stat. 14	96.5 E	6[-1]	S	RH-3.675	36	Orbita-II Radio Mayak	7.0 MHz 7.5 MHz	31 dBW
Stat. 14	96.5 E	9[6]	NH	RH-3.825	36	CCTV-4 (China) [PAL - for Chinese abroad]	6.6 MHz	31 dBW
Stat. 14	96.5 E	10[9]	NH	RH-3.875	36	Azerbaijan TV/Radio	7.5 MHz	31 dBW

Sat.	Orbit	Tr.#	Beam	Pol/Freq	BW	Service/ Description	Audio Subcarrier	Beam Center EIRP
INSAT II-B [INDIA] - 93° EAST								
Ins-2B	93.5 E	—	S	LH-2.575	30	Doordarshan TV	5.5 MHz	40 dBW
Ins-2B	93.5 E	[06]	S	V-3.828	30	DD Business/News	5.8 MHz	36 dBW
Ins-2B	93.5 E	[10]	S	V-3.909	30	DD Sports	5.8 MHz	36 dBW
Ins-2B	93.5 E	[13]	S	V-3.983	30	DD Metro	5.8 MHz	36 dBW
Ins-2B	93.5 E	[22]	S	V-4.145	30	DD Music	6.6 MHz	36 dBW
STATSIONAR 6 & 3 (C.I.S.) - 90° & 85° EAST								
Stat. 6	90 E	6 [-1]	S	RH-3.675	36	Dub'I II Radio Moscow	7.0 MHz 7.5 MHz	44 dBW
Stat. 6 [Russia]	90 E	10[9]	NH	RH-3.875	36	Orbita-II Radio Mayak	7.5 MHz 7.0 MHz	31 dBW
Stat. 6 [Russia]	90 E	11[11]	NH	RH-3.915	30	Dub'I-I Feed to Far East	7.5 MHz	26 dBW
Stat. 6 [Russia]	90 E	11[11]	NH	RH-3.942	30	Orbita-I Feed to Far East	7.0 MHz	26 dBW
Stat. 3	85 E	10[9]	NH	RH-3.876	36	Ahmadiyya Muslim TV [Friday & Saturday only] Audio in English Audio in Arabic	6.5 MHz 7.0 MHz 7.2 MHz	31 dBW
INSAT I-D (INDIA) - 82.9 EAST								
Ins-1D	82.9 E	S1	S	V-2.575 V-2.615	36 36	Doordarshan India All Community TV	5.5 MHz	42 dBW
Ins-1D	82.9 E	[23]	S	H-4.170	18	Doordarshan TV	5.5 MHz	30 dBW
Ins-1D	82.9 E	[24]	S	H-4.190	18	Doordarshan TV	5.5 MHz	30 dBW

Sat.	Orbit	Tr.#	Beam	Pol/Freq	BW	Service/ Description	Audio Subcarrier	Beam Center EIRP
STATSIONAR 13 (C.I.S.) - 80° EAST								
Stat. 13	80 E	6[-1]	S	RH-3.675	36	Dub'1-III	7.0 MHz	44 dBW
Stat. 13	80 E	10[9]	NH	RH-3.875	36	THVN -Vietnam Voice of Vietnam	7.5 MHz 7.0 MHz	31 dBW
Stat. 13	80 E	—	S	RH-11.525	36	Kazakhstan TV Kazakhstan Radio	7.0 MHz 7.5 MHz	40 dBW
INSAT 2-A (INDIA) - 74° EAST								
Ins-2A	74 E	[16]	S	H-4.000	36	Occasional Video	5.5/6.6 MHz	36 dBW
Ins-2A	74 E	[21]	S	H-4.115	36	Doordarshan TV	5.5 MHz	36 dBW
Ins-2A	74 E	[22]	S	H-4.150	18	Doordarshan TV	5.5 MHz	30 dBW
Ins-2A	74 E	[24]	S	H-4.175	18	Doordarshan TV	5.5 MHz	30 dBW
INTELSAT 505, 604, 602, & 507 - 66°, 63°, 60°, & 57° EAST								
I-505	66 E	15[06]	EH	RH-3.980	20	Canal France Int.	5.8 MHz	30 dBW
I-505	66 E	13[09]	Z	LH-4.016	20	NHK-Feeds to Japan	6.6 MHz	30 dBW
I-505	66 E	38[24]	G	RH-4.166	30	Worldnet [U.S. in PAL] Deutsche Welle [Germany in PAL]	6.60 MHz	29 dBW
I-604	63 E	38[23]	G	RH-4.168	20	Occasional Video- News and sports feeds	6.6 or	Varies
		38[24]	G	RH-4.188	20		6.65 MHz	
I-602	60 E	38[23]	G	RH-4.168	20	Occasional Video- News and sports feeds	6.6 or	Varies
		38[24]	G	RH-4.188	20		6.65 MHz	
I-507	57 E	51[2]	EZ	LH-3.735	30	Ch 3 Bangkok, Thai.	6.8 MHz	29 dBW
I-507	57 E	51[4]	EZ	LH-3.770	30	Ch 9 Bangkok, Thai.	6.8 MHz	29 dBW
I-507	57 E	53[10]	EZ	LH-3.900	30	BBC (to Hong Kong)	B-MAC	29 dBW
I-507	57 E	36[20]	G	RH-4.091	27	SIS (to Far East)	B-MAC	25 dBW
I-507	57 E	38[23]	G	RH-4.168	20	Occasional Video- News and sports feeds	6.6 or	Varies
		38[24]	G	RH-4.188	20		6.65 MHz	

Sat.	Orbit	Tr.#	Beam	Pol/Freq	BW	Service/ Description	Audio Subcarrier	Beam Center EIRP
STATSIONAR 5 & 12 (C.I.S.) - 53° & 40° EAST								
Stat. 5 [Russia]	53 E	6[-1]	S	RH-3.675	36	I Programma [Orbita-IV Vostok] & TV Afghanistan	7.0 MHz	44 dBW
Stat. 5 [Russia]	53 E	K1]	S	RH-11.525	36	Occasional Video	7.0 MHz	31 dBW
Stat.12 [Russia]	40.0 E	6[-1]	G	RH-3.675	36	II Programma [Moscow] Moscow Radio	7.5 MHz 7.0 MHz	32 dBW
Stat.12	40.0 E	7[1]	G	RH-3.725	36	TV 5 [France]	6.65 MHz	30 dBW
Stat.12	40.0 E	9[6]	G	RH-3.875	36	Channel SZTV	7.0 MHz	30 dBW
Stat.12	40.0 E	10[9]	G	RH-3.925	36	RTP International [Portugal]	6.65 MHz	30 dBW
Stat. 12 [Russia]	40.0 E	K1]	S	RH-11.525	36	Occasional Video	7.0 MHz	31 dBW
ARABSAT I-C - 31° EAST								
Abs I-C	31.0 E	1A	Z	V-2.634	32	MBC	6.6 MHz	43 dBW
Abs I-C	31.0 E	4	Z	RH-3.771	0.5	Radio Sudan	SCPC	33 dBW
Abs I-C	31.0 E	5	Z	LH-3.811	32	Canal Plus Int. [Fr.]	6.6 MHz	33 dBW
Abs I-C	31.0 E	7	Z	RH-3.82975	32	CNN International	6.6 MHz	33 dBW
Abs I-C	31.0 E	8	Z	LH-3.835	0.3	Radio Orient	SCPC	33 dBW
Abs I-C	31.0 E	9	Z	RH-3.866	32	Occ. Video - ABSU	6.65 MHz	33 dBW
Abs I-C	31.0 E	14	Z	LH-395925	32	Dubai TV [UAE]	6.60 MHz	33 dBW
Abs I-C	31.0 E	15	Z	RH-3.97775	32	Saudi 1 [Arabic]	6.65 MHz	33 dBW
Abs I-C	31.0 E	17	Z	RH-4.008	18	RTM-1 Morocco TV	6.65 MHz	33 dBW
Abs I-C	31.0 E	18	Z	LH-4.03325	32	Abu Dhabi TV [UAE]	6.60 MHz	33 dBW
Abs I-C	31.0 E	19	Z	RH-4.05175	32	Saudi 2 [English]	6.65 MHz	31 dBW
Abs I-C	31.0 E	20	Z	LH-4.062	18	Oman TV	6.60 MHz	31 dBW
Abs I-C	31.0 E	21	Z	RH-4.081	32	TV Mauritania	6.60 MHz	36 dBW
Abs I-C	31.0 E	22	Z	LH-4.10725	32	MBC	6.60 MHz	36 dBW
Abs I-C	31.0 E	23	Z	RH-4.12575	32	Arab League TV	6.60 MHz	33 dBW
Abs I-C	31.0 E	24	Z	LH-4.144	32	JRT TV Jordan	6.60 MHz	33 dBW
Abs I-C	31.0 E	25	Z	RH-4.16275	32	TV Egypt	6.60 MHz	33 dBW
Abs I-C	31.0 E	26	Z	LH-4.181	32	KSC Kuwait Radio Kuwait	6.60 MHz 5.8 MHz	33 dBW

Chapter Twelve: Satellite Directory by Country

AFGHANISTAN



BROADCAST ORGANIZATION:

People's Radio and Television

AFGHANISTAN (RTA)

P.O. Box 544

Kabul

Tel: 25622

ARMENIA



Government: In transition
 Population: 18,200,000
 Gross National Product: US\$ 190 million
 (1993 estimate)
 Language(s): Pushtu, Dari
 (Persian), Uzbek.
 Educated class
 speaks French
 Religion: Muslim
 Exchange Rate: Afghani
 (50 = 1 US\$)
 Time Standard: GMT+4.5
 Video Standard: PAL
 Electrical System: 220 a.c., 50 Hz
 Telephone Country Code: (93)
 Major City Telephone Codes: None
 Number of TV Sets: 108,000

INTELSAT REPRESENTATIVE:

Ministry of Communications

Kabul, Afghanistan

Mr. K. A. Sharar, Liaison Office

Tel: 22282

Asiasat EIRP/Coordinates:

Kabul 37 dBW (1.8m TVRO)

Elevation: 34 Azimuth: 128

Government: Republic
 (Member of the CIS)
 Population: 3,630,000
 Gross National Product: US\$ 16 billion
 (estimate)
 Language(s): Armenian,
 Azerbaijani
 Religion: Christian
 Time Standard: GMT+4
 Currency Standard: Rouble
 (1.65 = US\$ 1)
 Video Standard: SECAM
 Electrical System: 127/220 a.c., 50 Hz
 Telephone Country Code: (7)
 Major City Telephone Codes: None

INTELSAT REPRESENTATIVE:

Ministry of Communications

Nansen Str. 3, Flat 89
Yerevan 375056 Armenia
Mr. S.A. Andreassian
Head, Board of Communications
Tel: 7-885-2-53-48-86
Fax: 7-885-2-53-25-41

EARTH STATION: Armenian 1 359° E IDR

AUSTRALIA



Government:	Commonwealth Nation (U.K.)
Population:	17,800,000
Gross National Product:	US\$ 260 billion
Language(s):	English
Religion:	Christian
Currency:	Australian Dollar (1.51 = 1 US\$)
Time Standard:	GMT+10 (GMT+8 Perth; +9.5 Darwin/ Adelaide)
Video Standard:	PAL
Electrical System:	240 a.c., 50 Hz
Telephone Country Code:	(61)
Major City Telephone Codes:	
Sydney - 2	
Melbourne - 3	
Brisbane - 7	
Adelaide - 8	
Perth - 9	

Hobart - 02
Wollongong - 42
Newcastle - 49
Geelong - 52
Canberra - 62
Gold Coast - 75
Townsville - 77
Darwin - 89

INMARSAT OPERATORS:

IDB Business Group Inc.

Inmarsat IOR satellite

OTC Australia

Inmarsat IOR/POR satellites

INTELSAT REPRESENTATIVE:

OTC Australia

231 Elizabeth St.
Sydney NSW 2001
Australia
Mr. Adam Gajda, INTELSAT Ops.
Tel: (61) 2-287-5162
Fax: (61) 2-287-5135/287-5116

INTELSAT EARTH STATIONS:

EPPING TVRO - 177° E
EXMOUTH - 177° E
LOCKRIDGE 1 - 163° E
LOCKRIDGE 2 - 177° E
MACQUARIE - 174° E
MAWSON - 177° E
MELBOURNE - 177° E
PERTH 1 - 63° E
PERTH 2 - 177° E
PERTH 5 TVRO - 66° E
PERTH 6 - 60° E
SYDNEY 1 - 177° E
SYDNEY 2 - 174° E
SYDNEY 3 - 177° E
SYDNEY 4 - 183° E
WILLOUGHBY 1 - 177° E
WOOMERA TVRO - 177° E

Also C-Band Transportable uplink

DOMESTIC SATELLITE OPERATOR:
Optus Communications Pty. Ltd.

Level 11
54 Carrington Street
Sydney NSW 2000
Australia
Tel: (61) 2-238-7800
Fax: (61) 2-238-7974

BROADCAST ORGANIZATIONS:
AAP Reuters Communications

30 Ross St.
Glebe NSW 2037
Australia

Operator of News/Business news service transmitted via the Optus satellite system.

Australian Broadcasting Corporation (ABC)

G.P.O. Box 9994
Sydney, NSW 2001
Australia
David Hill, Managing Director
Paddy Controy, Director Television
Peter Loxton, Director Radio
Ms. Rosemary Sinclair, Director,
Strategic Development
Tel: (61) 2-333-1500

Broadcasts ABC domestic homestead and community broadcast service (HACBSS) on Optus domestic communications satellites.

Australia Television International

221 Pacific Highway
Gore Hill 2065
GPO 9994, Sydney NSW 2001
Australia
Ben Hawke, General Manager
Dominic Stone, Program Manager
Peter Ryall, Sales Manager
Ms. Cathy Gallagher, Public Relations Mgr.
Tel: (61) 2-950-3090
Fax: (61) 2-950-3064

Broadcasts international television satellite service to Asia on Palapa B2P, called Australian Television International and Radio Australia services. Australia Television International is a free-to-air satellite service which broadcasts sixteen hours of quality programming each day to Southeast Asia and Southern China. Programs range from top children's

programs to award-winning science and natural history, drama, news and current affairs, arts and premier sports events.

Australia Television International broadcasts in PAL via the Palapa B2P satellite to fifteen countries in Southeast Asia and Southern China. It aims to encourage greater awareness and understanding of Australian culture through quality programming. It is the only international broadcaster which produces a News Service with a regional focus, supplemented by news bulletins in the major languages of the region. As a sponsored service, Australia Television is able to carry promotional messages into the region. It has a potential audience of eight million people.

Golden West Network

30 King's Park Road
P.O. Box 1062
West Perth, WA 6005

Regional Rural Community Television Service (RCTS) which transmits direct-to-home TV programming via the Optus satellite system.

Ideas Channel

27 Carmen Street
St. Ives, Sydney NSW 2075
Australia
Mike Minehan, Director
Tel: (61) 2-963-3484
Fax: (61) 2-449-1442

The IDEAS CHANNEL - for International Degrees and Education Accessed by Satellite - produces educational TV programs for Asia-Pacific audiences. The Ideas Channel offers experienced and professional production crews who specialize in the design, production and delivery of TV education programs. All production elements are catered for - from conception, to training presenters and producing programs, as well as design and delivery of print and interactive computer backup services. The Ideas Channel also offers student enrollment and fee collection services in Southeast Asian countries. All courses, including school, teacher, trade, business and tertiary courses, are catered for.

Imparja Television Pty Ltd

14 Leichhardt Terrace
Alice Springs, NT 0871
Australia

Regional Rural Community Television Service (RCTS)

which transmits aboriginal direct-to-home TV programming via the Optus satellite system.

Nine Network Australia

61 Lavender St., 2nd Floor
P.O. Box 504
Milson's Point 2061
Australia

Television broadcaster operating Nine Network across Australia; operator of full-time transpacific satellite transponder on INTELSAT POR 180° East; operator of full-time domestic satellite transponder on Optus B1.

Seven Network Australia

Television Center
Mobbs Lane
Epping, NSW 2121
Australia

Television broadcaster operating Seven Network across Australia; operator of full-time transpacific satellite transponder on INTELSAT POR 180° East; operator of full-time domestic satellite transponder on Optus B1.

Sky Channel Pty Ltd.

Unit 2/81 Frenchs Forest Road
Frenchs Forest NSW 2086
Australia
David Dodds, Managing Director
Rob Lyons, Program Manager
John Maras, Production Manager
Tel: (61) 2-451-0888
Fax: (61) 2-975-6443

Satellite TV services, videoconferencing services, international dissemination of Australian horse racing.

Special Broadcasting Service

14 Herbert St.
Artarmon, NSW 2064
Australia
Malcom Long, Executive Director
Andy Lloyd-James, Head of Television
Quany Luce, Head of Radio
Peter Barnett, Director TV Business Affairs
Tel: (61) 2-480-2828
Fax: (61) 2-901-3012

Ten Network Australia

44 Bay Street
Ultimo, Sydney, NSW 2007
Australia
Peter Vilner, CEO
Gerry Thorley, General Manager, Sydney
Peter Booth, Communications Manager
Tel: (61) 2-844-1010
Fax: (61) 2-281-3313

Television broadcaster operating Ten Network across Australia; operator of full-time transpacific satellite transponder 21/11 on INTELSAT POR 180° East; operator of full-time domestic satellite transponder 4 on Optus B1.

Turner Broadcasting (Australia) Pty. Ltd.

Level 22, AGL Centre
111 Pacific Highway
North Sydney NSW, 2060
Australia
Mr. Greg Ell, General Manager
Tel: (61) 2-957-5255
Fax: (61) 2-957-5161

World Television News (WTN)

c/o Nine Network TV Centre
24 Artamon Rd.
Willoughby, NSW 2068
Australia
Tel: (61) 2-965-2986
Fax: (61) 2-901-3413

SATELLITE TVRO MANUFACTURERS:

Av-Comm Pty Ltd.

70 Wanganella Street
Balgowlah, NSW 2093
Australia
Gary Cratt, Technical Director
Tel: (61) 2-949-7417, 948-2667
Fax: (61) 2-949-7095

Products manufactured: decoders, C-band feedhorns; products distributed: C & K Band dishes, LNBs, feedhorns, Dynalink and Dynasat satellite receivers, SCPC receivers, PLL and Dual polarity LNBs, Dynalink Satmeters, cables & accessories. Complete C & K Band systems, auto trackers; services provided: technical consulting.

Earthlink Microwave Technology

4 Moreton Rd.
Minto Hts., NSW
Australia
Dr. Ronald Weatherall

Manufacturer of TVRO antennas.

Farlco Pty Ltd

Satellite Receiver Systems
P.O. Box 201
Lot 20, Thora Rd.
Bellington NSW 2454
Australia
Tel: (61) 66-55-19-79
Fax: (61) 66-55-00-79

Matchmaster TV Sales Pty. Ltd.

2 Mimosa St.
Bexley, NSW 2207
Australia
Robert F. Waterford, Managing Director
Robert J. Waterford, Co-Director
David W. Waterford, Co-Director
Tel: (61) 2-587-4499
Fax: (61) 2-588-3137

Products manufactured: TV antennas and hardware; products distributed: Antennas, amplifiers, cable connectors, SMATV equipment; services provided: CATV, SMATV system design.

Nationwide Antenna Systems plc

17 Campbell St.
Bowlen Hills,
Brisbane, Queensland 4006
Australia
Geoff Dargie, Managing Director
Marianne Dargie, Director
Tel: (61) 7-252-2947
Tel: (61) 7-252-8574

Products manufactured: K Band dishes and TV antennas; products distributed: C & K band dishes, LNBs, feedhorns, receivers, SMATV accessories, transmit systems, TV antennas; services provided: Earth station/SMATV installations.

Opac Pty. Ltd

99-105 Boundary Rd.
Peakhurst NSW 2210 Australia
Jacob Kennes
Tel: (61) 2-584-1233
Fax: (61) 2-584-1452

Manufacturer and distributor of antennas and other TVRO equipment.

Plessey Australia Pty. Ltd.

Faraday Park
Railway Rd.
Meadowbank, NSW 2114
Australia

Manufacturer of B-MAC IRDs for Australian HCBSS and RCTS direct-to-home satellite TV services. Manufacturer of commercial B-MAC decoders.

Wavetrak Pty. Ltd.

276 Coventry Street
South Melbourne, VIC 3205
Australia
Tony Moore-Stevens, Sales Director
Tel: (61) 3-690-6939
Fax: (61) 3-690-9006

Manufactures LNBs, feedhorns, antennas, cables, receivers, positioners, accessories and test equipment.

SATELLITE TVRO DISTRIBUTORS:

Acesat Satellite Corporation

P.O. Box 428
Carringbah, NW 229
Australia

Distributor of TVRO products

CMPS&F Pty Ltd

200 Mary St.
Brisbane, Queensland 4000
Australia
John McBratney
Tel: (61) 7-233-1611
Fax: (61) 7-233-1649

Inacoe Pty Ltd.

6 Narranda Place
Mooloolaba, Queensland 4557
Australia
Darryl V. Drew, Director
Tel: (61) 74-44-2381
Fax: (61) 74-44-4681

Importer of TVRO components

Peter C. Lacey Services Ltd.

80 Dandenong Rd.
Frankston, VIC 3199
Australia
Peter C. Lacey

Tel: (61) 3-783-2388
Fax: (61) 3-783-5767

Distributor of TVRO components and publications

Pirimai Satellite Systems

165 Burwood Rd.
Burwood, Sydney, NSW
Australia
Pieter Coetree, Satellite Sales Mgr.
Gordon Stevenson, Director
Janice Stevenson, Director
Tel: (61) 2-747-2533
Fax: (61) 2-744-0047

Distributor of home satellite TV systems

Satellite Systems Communications

Private Mail Bag 8
Via Coober Pedy, SA 5723
Australia
Tel: (61) 8-707-994
Fax: (61) 8-707-934

Videocraft

82 Reserve Rd. Unit 12
Artarmon, NSW 2064
Australia
John O. Phillips

Distributor and seller of TVRO products

Videosat Pty Ltd.

83 Alexandria Parade
Wahroonga NSW 2076
Australia
Wally Shand

Distributor and seller of TVRO products

Winscot Trading Pty Ltd.

276 Coventry Street
South Melbourne, VIC 3205
Australia
Tony Moore-Stevens, Sales Director
Tel: (612) 3-699-5740
Fax: (612) 3-690-9006

Products distributed: LNBs, feedhorns, antennas,

cables, receivers, positioners, accessories and test equipment.

SATELLITE TVRO SERVICES:

Audiosat

35 Mamre Rd., St. Marys, NSW
Australia
Gary Rose, Owner/Installer
Tel: (61) 2-623-2368

Domestic satellite and audio-visual installations

Australian Satellite Services Pty. Ltd.

Peter C. Evans, NSW 2250 Australia
Tel: (61) 4-325-0655
Fax: (61) 4-325-0654

Satellite installations and consulting

P.C. Satellite TV Consultants

165 Burwood Rd.
Burwood, Sydney, NSW
Australia
Pieter Cortree, Director
Tel: (61) 2-747-2533
Fax: (61) 2-744-0047

Services provided: consulting and training for SMATV systems and home theater/satellite TV systems.

COMMUNICATIONS PUBLISHER:

Australian Pay TV News

Level 20, 133 Castlereach St.
GPO Box 3556
Sydney NSW 2001
Australia
Pip Bulbeck, Editor
Tel: (61) 2-264-7004
Fax: (61) 2-267-4056

Australian Pay TV News is an authoritative, detailed source of information on pay television and associated communications issues, including facts and analysis of the events, people and technologies that are shaping the new broadcasting environment, both in Australia and internationally. Subscribers have access to a monthly newsletter, a special hotline service, and faxed supplements to bring subscribers up-to-date as to when important developments occur.

COMMERCIAL MANUFACTURERS:
Andrew Antenna

153 Barry Rd.
Campbellfield, VIC 3061
Australia
K. Griesse, Sales & Marketing Manager
Tel: (61) 3-357-9111
Fax: (61) 3-357-9097

Manufacturer of feedhorns, antennas and accessories. Distributor of LNBs, receivers, modems, VSAT systems, uplink systems, antenna positioners.

ASI Technologies Pty Ltd.

80 Hargrove Avenue
Essendon Airport
Victoria 3041
Australia
Ron Chapman, Managing Director
Graham Chappell, Marketing Director
Dallas Clarke, Engineering Director
Karen Boag, Marketing Coordinator
Tel: (61) 3-374-1944
Fax: (61) 3-379-3789

Products manufactured: ASI-9000 System - a microcomputer based terminal for airliner cabin use, giving access to ground networks via satellite and VHF datalink. Operated by cabin crew by means of a windows touchscreen. Products distributed: aircraft communications and management system (ACAMS) fitted to Qantas's B747-400 aircraft and progressively to all B747 and B767-300 in their fleet. Services provided: technical consulting to airlines; on board added value services, downlink and uplink data services for airline passengers.

Codan Pty. Ltd.

81 Graves Street
Newton, South Australia 5074
Australia
Mike Heard, Managing Director
Allan Gobolos, Manager, Satellite Comm.
Gary Shmith, Marketing Mgr. Satcomm
Graham Zacher, Customer Support
Tel: (61) 8-336-0311
Fax: (61) 8-337-6090

Manufactures C-band transceivers, HF-SSB communications systems.

CSIRO Division of Radiophysics

P.O. Box 76
Epping, NSW 2121
Australia
Dr. T.S. Bird, Research Manager
Tel: (61) 2-372-4220
Fax: (61) 2-372-4446

Products manufactured: prototype satellite antennas, ground station antennas, feedhorns and multi-band feed systems, and specialized waveguide components. Services provided: Technical consulting, antenna measurement services, antenna design services.

C.V.A. (Cablevision Australia Pty. Ltd.)

2 Mimosa St.
Bexley, NSW 2207
Australia
Peter Keenan, Manager
Kent Lardner, Marketing Manager

Products manufactured: filters; products distributed: MATV, SMATV, Trilogy cable, satellite antennas & equipment, test equipment; services provided: system design, analysis. Technical consulting and newsletter service.

Global Satellite System Pty. Ltd.

126 Union Road
Surrey Hills, VIC3127
Australia
Paul Daley, President
Eugene Razbash, Executive Director
Tel: (61) 3-888-5622
Fax: (61) 3-830-5846

Products manufactured: satellite audio receivers, antenna positioners; products distributed: LNBs, feedhorns, antennas, receivers (including SCPC), test equipment, accessories, Inmarsat systems, weather satellite systems, VSAT systems; services provided: technical consulting, videoconferencing, system installation and maintenance.

Icom Ltd.

11 Brodie Hall Drive
Technology Park, Unit 2
Bentley, Perth 6102
Australia
Tel: (61) 9-470-2088
Fax: (61) 9-470-2825

Imagicians International

Suite 1, 5 Wulworra Ave.
Cremorne Point
Sydney, NSW 2090
Australia
Adam Wells, General Manager
Tel: (61) 2-953-4607
Fax: (61) 2-953-3772

A satellite event production company, specializing in media publicity, music and film industry events. Producer of broadcast and non-broadcast satellite link-ups.

Telstra Maritime

Unit 3, 39 Herbert Street
St. Leonards, NSW 2065
Australia
Don Koulaouzos, Manager Aero & Land Mobile
Jim Simpson, Manager Maritime and Safety
Tel: (61) 2-901-2102
Fax: (61) 2-906-4894

Mobile radio and satellite communications arm of Telstra Corporation Ltd., a new enterprise born out of a merger between Telecom Australia and OTC. Operates Inmarsat Land Earth Station in Perth.

OTHER:

Australian Space Insurance Group

Level 5, 15 Queen Street
Melbourne VIC 3000
Australia
Mr. M.D. Baird, General Manager
Mr. W.D. Jones, Manager

Satellite Risk Insurance

Australis Media Ltd.

303 Castlereagh St.
Sydney 2000 Australia
Rod Price, Chairman
Neil Gamble, CEO
Brian Reynolds, COO
Ross McCreath, Special Projects
David Jupp, Chief Engineer

Services: Recipient of Pay TV license from the Australian government. Subscription broadcast via MMDS English-language news and business channel - Newsvision, Chinese Channel, New World TV, TeleItalia (Italian), Hellenic TV (Greece), ALB TV (Arabic).

**Optus—Australia's
Domestic Satellite System**

In August and November of 1985, NASA space shuttles Discovery and Atlantis launched Australia's "Aussat" A1 and A2 telecommunications satellites into orbit. On September 16, 1987, Aussat A3 was launched, completing Australia's first-generation domestic satellite network. In 1992, Optus Communications Pty Ltd.—a telecommunications group which includes BellSouth Corp and Britain's Cable & Wireless plc—acquired ownership of the government-owned satellite operator Aussat Pty. Ltd. The second-generation Aussat B satellites—then in an advanced stage of construction—were renamed Optus B1 and B2 while the in-orbit Aussat A satellites were renamed Optus A1, A2, & A3.

On August 14, 1992, the first of a new generation of Australian satellites was launched by a Chinese Long March 2E rocket. Built by Hughes Space and Communications Group of Los Angeles, Optus B1 was the first of the Hughes-built HS 601 spacecraft design.

On December 21, 1992, the Optus B2 satellite was lost shortly after its launch by a Chinese Long March rocket. A replacement satellite for Optus B2 currently is under construction at Hughes Aircraft Company in El Segundo, California.

At the time of writing, three Optus satellites were in geostationary orbit: Optus B1 at 160 degrees East Longitude, Optus A3 at 156 degrees East Longitude, and Optus A2 at 164 degrees East Longitude. Optus A1 was retired from service following its replacement by Optus B1.

Optus B Satellites

Each Optus B satellite carries a communications payload with fifteen medium-powered, 50-watt Ku-band transponders, one

high-powered, 150-watt L-band transponder for the provision of mobile satellite services in Australia, and an experimental Ka-band beacon. Optus B also has a retro-reflector mirror for laser distance ranging and time-transfer experiments.

Optus B spacecraft have 54-MHz-wide Ku-band transponders. The wider bandwidth over the Optus A satellites permits the simultaneous transmission of two video signals, thereby increasing capacity for TV coverage. The additional bandwidth also allows more voice and data traffic to be carried by each transponder. The Optus B satellites also generate higher EIRP levels than their predecessors. For most applications, the higher power levels will permit smaller dishes to be used down on the ground.

Up to eight transponders on each satellite

can be switched to a specially-designed New Zealand footprint to transmit services in New Zealand, or relay services between Australia and New Zealand.

The Optus B antenna payload consists of seven transmit and three receive beams. The satellite's *National* footprint encompasses all of Australia and its offshore region with enhanced coverage in the Southeast (SE) sector of the country. Six spot beams cover Western Australia (WA), Central Australia, South Australia and the Northern Territory (CA), Queensland (NE), NSW, Victoria and Tasmania (SE), New Zealand (NZ), and Trans-Tasmanian (Australia to New Zealand).

The Optus B high performance spot beams are capable of delivering Pay Television signals nationally. These beams will provide sufficient strength to enable reception

*Optus B Channel
Frequency and
Beam Assign-
ments*

Tr.	Pol	Uplink/Downlink†	Trans. Beam(s)††	Rec. Beam(s)††
01	V	14.0299/12.2819	NA, SE, NZ	NA/NZ
02	V	14.0925/12.3445	NA, SE, NZ	NA/NZ
03	V	14.1551/12.4071	NA, SE, NZ	NA/NZ
04	V	14.2177/12.4697	NA, SE, NZ	NA/NZ
05	V	14.2803/12.5323	NA, SE, NZ	NA/NZ
06	V	14.3249/12.5949	NA, SE, WA, NZ	NA/NZ
07	V	14.4055/12.6575	NA, SE, WA, NZ	NA/NZ
08	V	14.4681/12.7201	NA, SE, WA, NZ	NA/NZ
09	H	14.0612/12.3132	NB, HP	NB
10	H	14.1238/12.3758	NB, HP	NB
11	H	14.1864/12.4384	NB, NE, HP	NB
12	H	14.2490/12.5010	NB, CA, HP	NB
13	H	14.3116/12.5636	NB, HP	NB
14	H	14.3742/12.6262	NB, NE, CA, HP	NB
15	H	14.4368/12.6888	NB, NE, CA, HP	NB

† Frequency in GigaHertz

†† NA = National A Beam (covers Australia and New Zealand)
 NB = National B Beam (covers Australia only)
 NZ = New Zealand Beam
 CA = Central Australia Beam
 NE = Northeast Australia Beam
 WA = Western Australia Beam
 HP = High Performance Beam

by tiny flat-plate antennas 50cm square.

Aussat B's Trans-Tasmanian (Australia to New Zealand) mode allows the available transponder power to be split between the Australian NA, WA, or SE transmit beams and the New Zealand (NZ) transmit beam.

Mobilesat Voice Encoding Selected

A "Mobilesat" mobile satellite communications service, which uses special L-band capacity on the Optus B satellites, uses a voice encoding technique developed by the Massachusetts Institute of Technology (MIT) and Digital Voice Systems, Inc. The Mobilesat system operates over a digital channel operating at the data rate of 6.6 kb/s. The voice encoder digitizes the speech signal at slightly higher than 4 kb/s.

Optus A Series Satellites

Optus A2 and A3 are specially-adapted HS 376 spin-stabilized spacecraft with a communications payload transmitting in

the 12.25 to 12.75 GHz Fixed Satellite Service (FSS) band. Eleven transponders are powered by 12 watt TWTAs, while four others can transmit medium-power DBS signals using 30 watt TWTAs.

Optus A satellites have a complex antenna array that features three pairs of cross-polarized reflectors and a beam-forming network consisting of twenty-three individual feedhorns. The smallest of the three antenna reflectors is capable of producing two cross-polarized national beams that can transmit signals to locations throughout Mainland Australia, Tasmania, Lord Howe Island, and the Northwest and Pacific shelf Ocean areas. Two other reflectors generate a total of five regional spot beams, with each beam delivering a nominal EIRP of 47 dBW into the intended coverage areas. An on-board microwave switching matrix can be activated by ground control to connect individual transponders to selected transmit beams.

Optus A Channel Assignment Plan

Tr.#	Pol	Uplink Freq.	Downlink Freq.	Beam
1	[V]	14025 MHz	12277 MHz	NA or SE
2	[V]	14089 MHz	12341 MHz	WA
3	[V]	14153 MHz	12405 MHz	NA or SE
4	[V]	14217 MHz	12469 MHz	NA or WA
5	[V]	14281 MHz	12533 MHz	SE
6	[V]	14345 MHz	12597 MHz	NA, PNG or SWP
7 †	[V]	14409 MHz	12661 MHz	NA, SE or WA
8 †	[V]	14473 MHz	12725 MHz	SE, WA, PNG or SWP
9	[H]	14057 MHz	12309 MHz	NB or NE
10	[H]	14121 MHz	12373 MHz	NB or CA
11	[H]	14185 MHz	12437 MHz	NE
12	[H]	14249 MHz	12501 MHz	NB or CA
13	[H]	14313 MHz	12565 MHz	NB
14 †	[H]	14377 MHz	12629 MHz	NB, NE or CA
15 †	[H]	14441 MHz	12693 MHz	NB, NE or CA

NA: National A Beam

NE: Northeast [Queensland]

WA: Western Australia

PNG: Papua New Guinea

NB: National B Beam

SE: Southeast Australia

CA: Central Australia spot beam

SWP: Southwest Pacific (Aussat A3 only)

† 30 watt TWTAs; all others have 12 watt TWTAs

OPTUS TELEVISION & RADIO SERVICES

Direct broadcast satellite (DBS) programming - *Homestead and Community Broadcasting Satellite Service (HACBSS)* - used by the Australian Broadcasting Corporation (ABC) extend ABC's radio and TV coverage to rural Australians.

Remote Community Television Service (RCTS) - regional commercial television to the Australian Outback. *Queensland Satellite TV, Imparja, and Golden West.*

The B-MAC transmission format used by the HACBSS and RCTS satellite services provides up to six high-quality sound channels and a utility data channel for teletext, on-screen emergency warnings, and other educational or informational services.

Multicultural and Distance Education Services - *Special Broadcasting Service (SBS)* distribute multicultural educational television and ethnic radio services to remote communities. *TV Oceania* is a service for Japanese tourists. *Australia TV International*, the overseas service of ABC for Southeast Asia, has a B-MAC encrypted feeder link on Optus B1.

Broadcast TV Backhaul Feed Channels - Used by *Australian Broadcasting Corporation (ABC)* and *Networks 7, 9, and 10.*

Optus A2 Enters Inclined Orbit

The loss of Optus B2 has forced Optus Communications into implementing an inclined orbit plan for the existing Optus A2 satellite which is nearing the end of its conventional mission lifetime. In early 1993, Optus elected to prolong the life of Optus A2 by suspending the satellite's North/South stationkeeping in order to conserve the spacecraft's remaining fuel reserves. The move was necessary because it would be two years or more before

Teleconferencing - *Rural Doctor's Satellite Network* and *The Enterprise Channel.*

Pub and Club Networks - Sky TV service for hotels, clubs, and other non-domestic premises. B-MAC encrypted.

Radio Distribution Services - *The Australian Broadcasting Corporation (ABC)* and *Macquarie* regional radio program feeds. *Australian Radio Network (ARNSAT)* - with full CD-quality transmissions.

OPTUS VIOCE & DATA NETWORKS

ITERRA - Long-distance telephone

AAP Reuters - Business news service.

Australian Department of Defense - A national disaster/emergency relief communications network.

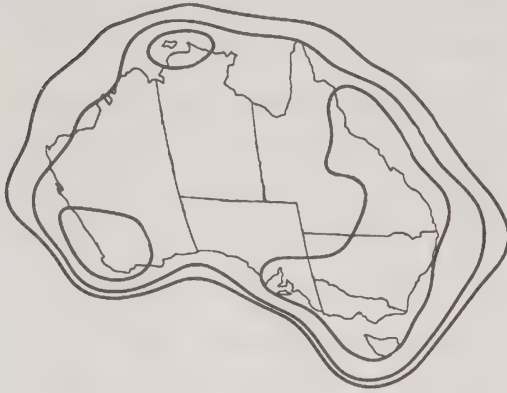
Australian Commonwealth Bank - A VSAT data distribution service.

Vistel Ltd. (Government of Victoria) - VSAT satellite system.

National Airline Telecom System - Link major Australian air traffic control and flight service centers.

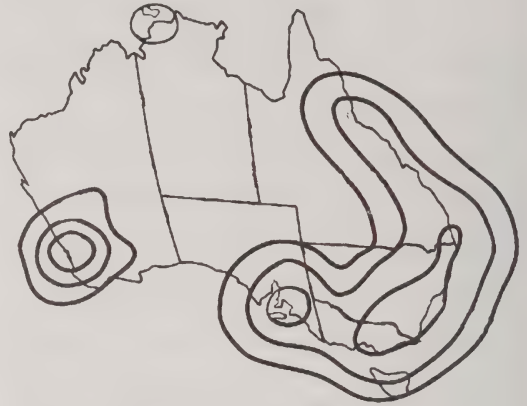
Hughes can build and launch a replacement satellite. Optus A2 presently carries a number of voice and data services which can continue to operate on a satellite occupying an inclined orbit. Optus B1 and A3 provide capacity for all Australian TV and radio services, as well as those voice and data services for large VSAT networks with earth stations which could not be converted for inclined orbit satellite tracking without incurring the major expense required to modify the antenna mounts.

*Optus B National A Beam
(Computer predict)*



1st contour:	45 dBW
2nd contour:	42 dBW
3rd contour:	40 dBW

*Optus B High Performance Beam
(Computer Predict)*



1st contour:	52 dBW
2nd contour:	47 dBW
3rd contour:	40 dBW

*Optus B National B Beam
(Computer Predict)*



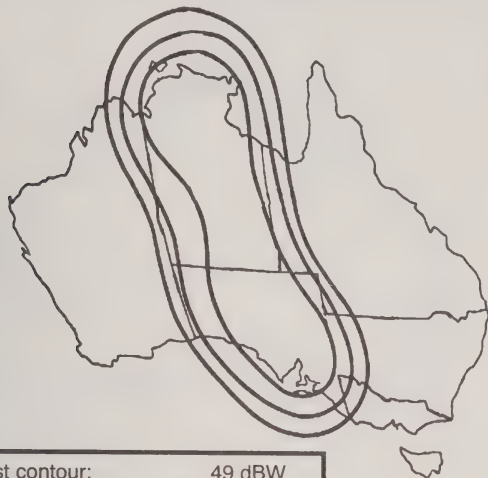
1st contour:	45 dBW
2nd contour:	42 dBW
3rd contour:	40 dBW

*Optus B North East Australia Beam
(Computer Predict)*



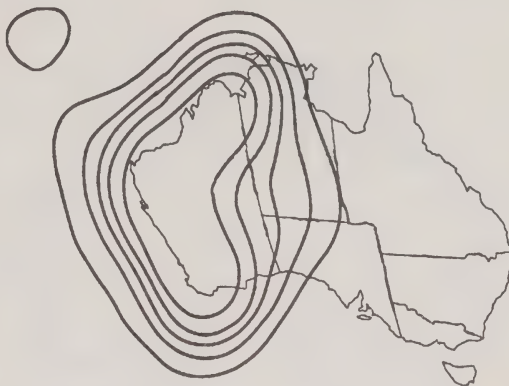
1st contour:	49 dBW
2nd contour:	47 dBW
3rd contour:	45 dBW

*Optus B Central Australia Beam
(Computer Predict)*



1st contour:	49 dBW
2nd contour:	47 dBW
3rd contour:	45 dBW

*Optus B Western Australia Beam
(Computer Predict)*



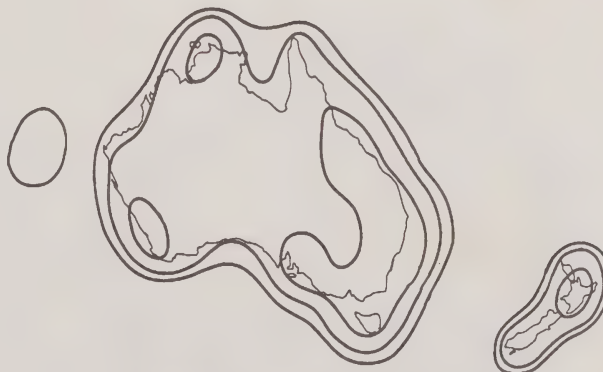
1st contour:	49 dBW
2nd contour:	47 dBW
3rd contour:	45 dBW

*Optus B Southeast Australia Beam
(Computer Predict)*



1st contour:	52 dBW
2nd contour:	47 dBW
3rd contour:	45 dBW
4th contour:	42 dBW

*Optus B National A and New Zealand
Receive G/T Beam (Computer predict)*



1st contour:	2 dB/K
2nd contour:	-1 dB/K
3rd contour:	-3 dB/K

*Predicted Minimum EIRP
(dBW) for the Optus A
12 Watt National Beams*



*Predicted Minimum EIRP
(dBW) for the Optus A
12 Watt Southeast Beam*



*Predicted Minimum EIRP
(dBW) for the Optus A
30 Watt National Beams*



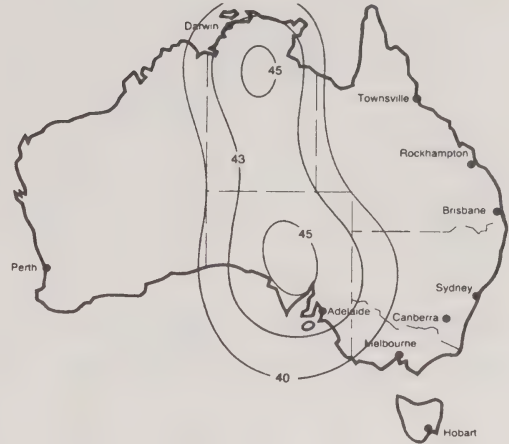
*Predicted Minimum EIRP
(dBW) for the Optus A
30 Watt Southeast Beam*



*Predicted Minimum EIRP
(dBW) for the Optus A
12 Watt Northeast Beam*



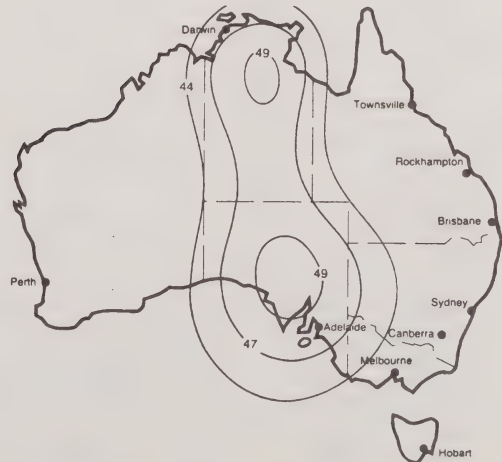
*Predicted Minimum EIRP
(dBW) for the Optus A
12 Watt Central Australia Beam*



*Predicted Minimum EIRP
(dBW) for the Optus A
30 Watt Northeast Beam*



*Predicted Minimum EIRP
(dBW) for the Optus A
30 Watt Central Australia Beam*



Predicted Minimum EIRP
(dBW) for the Optus A
12 Watt Western Australia
Beam



Predicted Minimum EIRP
(dBW) for the Optus A
30 Watt Western Australia
Beam



AZERBAIJAN



Government:	Republic (member of the CIS)
Population:	7,360,000
Gross National Product:	US\$ 28 billion (1993 estimate)
Language(s):	Azerbaijani, Russian, Armenian
Religion:	Muslim
Currency:	Manat (N/A = 1 US\$)
Time Standard:	GMT+4
Video Standard:	SECAM
Electrical System:	127/220 a.c., 50 Hz
Telephone Country Code:	(7)
Major City Telephone Codes:	None

BROADCAST ORGANIZATIONS:

Radio/TV Azerbaijan
Baku

Satellite programmer using the STATIONAR satellite system.

BAHRAIN



Government: Emirate
 Population: 572,000
 Gross National Product: US\$ 3.015 billion
 (Estimated 1993)
 Language(s): Arabic, Kurdish
 Religion: Muslim
 Time Standard: GMT+3
 Currency Standard: Dinar
 (0.37 = US\$ 1)
 Video Standard: PAL
 Electrical System: 220 a.c., 50 Hz
 Telephone Country Code: (973)
 Major City Telephone Codes: None

INTELSAT REPRESENTATIVE:

Bahrain Telecommunications Co. (BATELCO)

P.O. Box 14
 1095 Road 1425
 Al Hamalah 1014 Bahrain
 John Pearce, Manager Operations
 Tel: 973-883366, 884-888
 Fax: 973-274458/884007

EARTH STATIONS:

RAS ABU JARJUR 1 - 18°W
 RAS ABU JARJUR 2 - 60° E
 RAS ABU JARJUR 4 - 18°W

SATELLITE TVRO COMPANIES:

Satlink Limited

P.O. Box 3300
 Manama
 Bahrain
 Mr. Bader Y.R. Aldoseri, Chairman
 Mr. Khalid Y.R. Aldoseri, Executive Director
 Mr. Adel Aldoseri, Deputy Executive Director
 Mr. Henry Stevens, Special Projects Manager
 Tel: (973) 536-000
 Fax: (973) 336-666

Products distributed: Kaultronics satellite antennas, Drake receivers, SMATV and CATV products, Gardiner LNBs, Chaparral Communications feedhorns; services provided: Technical consulting, videoconferencing, satellite earth stations and MMDS installations.

BANGLADESH



Government: Republic, U.K. Commonwealth member
 Population: 122,000,000
 Gross National Product: US\$ 23 billion
 (1993 estimate)
 Language(s): Bengali, Chakma, Magh. English also is common among educated classes.

Religion: Muslim, with 12%
Hindu minority
Currency: Taka
(39.07 = 1 US\$)
Time Standard: +6:00 GMT
Video Standard: PAL B
Electrical System: 220/440 a.c., 50 Hz.
Telephone Country Code: (880)
Major City Telephone Codes:
Dacca - 2
Chittagong - 31
Khulna - 41
Mymensingh - 91
Jessore - 421
Barisal - 431
Rangpur - 521
Rajshahi - 721
Sylhet - 821

Number of TV Sets: 4,860,000

INTELSAT REPRESENTATIVE:

Teleboard DACCA

(880) 2-83-42-72
Bangladesh T and T board
Telejogajog Bhaven
36/1, Mymensingh Rd.
Dhaka 1000
Bangladesh
Mr. Abdus Salim, Chairman
Tel: (880) 2-831-550/880-2-407-800
Fax: (880) 2-833-003

EARTH STATIONS:

BETBUNIA - 60° E
TALIBABAD - 60° E

Asiasat EIRP/Coordinates:
Dhaka: 33 dBW (3m TVRO)
Elevation: 58, Azimuth: 146

BROADCAST ORGANIZATIONS:

Bangladesh Television (BTV)

121 Kazi Nazrul Islam Avenue
Dhaka
Tel: (880) 2-40-01-31 to 39
Fax: (880) 2-83-29-27

SATELLITE TELECOMMUNICATIONS COMPANIES:

Bangladesh Rural Telecom Authority

Rajuk Annexe Bldg.
Dilkusha Commercial Area
Dhaka, Bangladesh
Major T.I.M. Nurun Nabi,
Managing Director
Tel: (880) 2-864-510
Fax: (880) 2-862-040

Multiplex Services Ltd.

Amanat Manzil 48,
Purana Paltan, Dhaka 1000
Bangladesh
Tel: (880) 2-246-354
Fax: (880) 2-833-3959

Saag Trading International

KA 157/A
Kiril
Dhaka, 1229
Bangladesh
Sheponi Shah Gen. Mgr.

Trade Winds (Pvt.) Ltd.

55 Purana Pattan (1st Floor)
Dhaka, 1000
Bangladesh
N.H. Khan, Managing Director
Tel: (880) 2-242-514

BHUTAN



Government: Monarchy
Population: 1,660,000
Gross National Product: US\$ 290 million (1993 estimate)
Language(s): Dzongkha, Kebumtamp, Sarchagpokha, Nepali
Religion: Buddhist, with 25% Hindu minority
Currency: Ngultrum (26.35 = 1 US\$)
Time Standard: GMT+5.5
Video Standard: PAL
Electrical System: 220 a.c., 50 Hz.
Telephone Country Code: (975)
Major City Telephone Codes: None

INTELSAT REPRESENTATIVE:**Department of Telecom**

Thimphu, Bhutan
 Mr. Tshering Dorji,
 Director
 Tel: 975-22-125
 Fax: 975-22-098

EARTH STATION:

THIMPHU - 60° E

Asiasat EIRP/Coordinates:
 Thimbu: 33 dBW (3m TVRO)
 Elevation: 53; Azimuth: 149

BRUNEI DARUSSALAM



Government: Sultanate, Commonwealth Member (U.K.)
Population: 450,000
Gross National Product: US\$ 3 billion (1993 estimate)
Language(s): Malay, English, and Chinese
Currency: Brunei Dollar or Ringgit (1.59 = 1 US\$)
Time Standard: +8 GMT
Video Standard: PAL B
Electrical System: 110/220 a.c., 50 Hz
Telephone Country Code: (673)
Major City Telephone Codes:

Bandar Seri Begawan - 2
 Seria - 3
 Kuala Belait - 3

Number of TV Sets: 84,500

INTELSAT REPRESENTATIVE:**Contels Bandar Seri Begawan**

Tel: (673) 2-22-06-16
 Fax: (673) 2-24-33-00

EARTH STATIONS:

BRUNEI 1 - 63° E
 TELISAI 1 - 174° E
 TELISAI 2 - 60° E

BROADCAST ORGANIZATIONS:**Radio Television Brunei (RTB)**

Bandar Seri Bagawan 2042
 Brunei Darussalam
 Tel: (673) 2-43-111

Fax: (673) 2-41-882

REGULATORY ORGANIZATIONS:**Ministry of Communications**

Old Airport Berakes, Bendar Seri Bagawan

2051 Negara,

Brunei Darussalam

Mr. Lim Kee Beng

Senior Executive Engineer (N.S.)

Telecom Department

Tel: (673) 02-242-324

Fax: (673) 02-243-300

Hj Marsad bin Hj Ismail, Senior Telecom Engineer

Tel: (673) 2-42-526

Fax: (673) 2-20127

OTHER:**Limbang Trading Co.**

898 Jalan McKerron

P.O. Box 43

K Belait 6000

Brunei Darussalam

Mr. Baiju Salam

INSTALLATION COMPANIES**SMATV, MATV, PAY-TV INSTALLATIONS**

AZIMUTH is the region's leading supplier of satellite TV equipment to the Hotel, Apartment and Embassy Sectors. From full turnkey projects to the upgrading of existing facilities. AZIMUTH is the company of choice for the Hospitality Industry. AZIMUTH also provides a full range of consulting services. Full after-sales service is provided, including Maintenance Contracts.

Azimuth (Far East) Ltd, 5 Wangjing**Zhonghuan Nanlu, Chaoyang District,****Beijing, P.R. China 100015****Tel: +(86) [1]-436-1868 Fax: +(86) [1]-436-1891****BURMA (MYANMAR)**

Government:

Population:

Language(s):

Religion:

Time Standard:

Currency Standard:

Video Standard:

Electrical System:

Telephone Country Code:

Major City Telephone Codes: None

Number of TV Sets:

Military

43,800,000

Burmese, Karen,
Shan

Buddhist,

5% Christian,

4% Muslim

GMT+6.5

Kyat (6.25 = US\$ 1)

NTSC

230 A.C., 50 Hz.

(95)

71,200

INTELSAT REPRESENTATIVE:**Post and Telecommunications Corp.**

(GENTEL RANGOON)

43 Bo Aung Kyaw Street

Yangon, Myanmar (BURMA)

U Soe Tha, Managing Director

Tel: (95) 1-87991

INTELSAT EARTH STATION: YANGON - 60° E

Home Satellite TV Legal Status: Legal with government-issued license.

Asiasat EIRP/Coordinates:
 Rangoon: 32 dBW (3m TVRO)
 Elevation: 68; Azimuth 150

BROADCAST ORGANIZATIONS:

Burma Broadcasting Service

GPO Box 1432
 Rangoon
 Tel: (95) 1-31-355

CAMBODIA (KAMPUCHEA)



Government:	Monarchy
Population:	7,460,000
Gross National Product:	US\$ 600 million
Language(s):	Khmer, Kuy, Chinese, French & Vietnamese
Religion:	Buddhist
Currency:	Riel (3,584.19 = 1 US\$)
Time Standard:	+7 GMT
Video Standard:	SECAM (M)
Electrical System:	120/220 a.c., 50 Hz.
Telephone Country Code:	(855)
Major City Telephone Codes:	None
Number of TV Sets:	40,300

Asiasat EIRP/Coordinates:
 Phnom Penh: 37 dBW (1.8m TVRO)
 Elevation: 76; Azimuth 177

BROADCAST ORGANIZATIONS:

Democratic Kampuchean Television

19 Rue 242
 Donpenh
 Phnom Penh
 Cambodia
 Tel: 22349

REGULATORY ORGANIZATIONS:

**Ministry of Communications,
 Transport & Posts**
 Phnom Penh

SATELLITE TVRO COMPANIES:

Cambodia Samart Co., Ltd.

#39, Street 105,
 Sang Kat Boeng Pralit
 Khann 7 January
 Phnom Penh,
 Cambodia
 Tel: (855) 1-910013~23

CHINA, PEOPLE'S REPUBLIC OF



Government:	Socialist State
Population:	1,188,600,000
Gross National Product:	US\$ 575.8 billion (1993 estimate)
Language(s):	Mandarin, Cantonese, Wu, Hakka, Xiang Gan, Min, Zhuang, Hui, Yi, Fuking

Religion: Non-religious majority, 6%
Buddhist minority
Currency: Yuan (5.71 = 1 US\$)
Time Standard: +8 GMT
(+9 Summer)
Video Standard: PAL D
Electrical System: 220 a.c., 50 Hz.
Telephone Country Code: (86)
Major City Telephone Codes:

Beijing - 1
Guangzhou - 20
Shanghai - 21
Tianjin - 22
Shenyang - 24
Nanking - 25
Wuhan - 27
Chengdu - 28
Xi'an - 29
Taiyuan - 351
Dalian - 411
Changchun - 431
Harbin - 451
Jinan - 531
Chongqing - 811

Number of TV Sets: 144,000,000

INTELSAT REPRESENTATIVE:

PK TELECOM

Ministry of P&T
13 West Changan Avenue
Beijing 100804 PRC (China)
Mr. Yang Xuerning
Director General of Telecom.
Tel: (86) 1-661390
Tlx: 222185 DGTEL

INTELSAT EARTH STATIONS:

BEIJING 2 - 63° E
BEIJING 3 - 174° E
BEIJING 4 - 66° E
BEIJING 9 - 60° E
BEIJING 10 - 177° E
BEIJING 13 - 174° E
CHANG JIA WAN 1
(XIAU SATELLITE CONTROL CTR) - 177° E
IGP 1 WANSHOUSI - 174° E
SHAHE 1 - 177° E
(CHINA YA XIN ELECTRONIC CO.)
SHAHE 2 - 63° E (INMARSAT)

SHANGHAI 1 - 174° E
(SHANGHAI P&T ADMIN)
SHANGHAI 2 - 174° E
SHANGHAI 3 - 63° E
XI CHANG 1 - 174° E
(XI CHANG SATELLITE LAUNCH CENTRE)
XINHUA BROADCAST - 63° E
(XINHUA NEWS AGENCY)
YUAN WANG 1 - 177° E
(CHINA BUREAU OF OCEANOGRAPHY)
YUAN WANG 2 - 177° E
(SAME AS ABOVE)

Also C- and Ku-Band transportables

In addition to the above-mentioned international earth stations, China also has more than 60 domestic satellite earth stations which interface with the INTELSAT satellite system through the INTELSAT satellite located at 57 degrees East Longitude.

SHPOSTEL

276 North Suzhou Rd.
Shanghai, PRC (China)
Mr. Wang Yishou
Tel: (86) 3-248-635
Fax: (86) 3-245312

INMARSAT OPERATOR:

Beijing Marine Comms & Nav Co.

IOR/POR - Beijing

Asiasat EIRP/Coordinates:
Shanghai: 36 dBW (1.8m TVRO)
Elevation: 50; Azimuth: 209

BROADCAST ORGANIZATIONS:

China Central Television (CCTV)

No. 11 Fuxinglu Rd.
Beijing 100859
Tel: (86) 1-801-1144
Fax: (86) 1-801-1149

SATELLITE COMPANIES:**Azimuth (Far East) Ltd.**

S Wang Jing Zhong Huan Nanlu
Chaoyang,
Beijing 100105 PRC
Colin B Withers, General Manager
Anthony J. Black, Technical Director
Lisa Zeng, Sales and Marketing Manager
Grace Zhu, Office Manager
Tel: (86) 1-436-1898
Fax: (86) 1-436-1891

Services provided: installation of SMATV, MATV,
and Pay TV reception systems.

Azimuth is the leading SMATV, MATV, PAY TV
installation company in the China Region with
offices in Beijing, Hong Kong and Ulan Bator. Based
in Beijing, our British engineers have overseen more
than 200 successful projects in China alone.

**Beijing Asia Satellite Communications
Technology Co., Ltd.**

P.O. Box 2727
Beijing 100080 PRC
Tel: (86) 1-2562573
Fax: (86) 1-256-1264

Products manufactured: satellite receiving equip-
ment.

China Great Wall Industry Corp.

21 Huangsi Dajie
Xicheng Qu
Beijing 100011 PRC
Prof. Chen Shouchun, Vice President
Tel: (86) 1-837-2505, -2507
Fax: (86) 1-837-3155

Comstream Corporation

Far East China Trade Centre
No. 1 Jianguomenwai Ave.
Suite 2309
Beijing, PRC
Michael Sacharski
Tel: (86) 1-505-4824
Fax: (86) 1-505-4842

Products manufactured: digital audio transmission
equipment.

Satellite Communications Co.

Chinese Academy of Sciences
P.O. Box 2727
Beijing, PRC 100080
Tel: (86) 1-256-1262
Fax: (86) 1-256-1264

Shijiazhuang Comms Labs

P.O. Box 174
Shijiazhuang, Hebei, China
Mr. Luo Zheng Bin
Tel: (86) 3-113-3330

TRADE SHOW ORGANIZER:**China Radio & TV Co.**

No. 9 Zhen Wu Miao Er Tiao
Fu-Xing Men Wai St., West District
Beijing 100866 PRC
Ms. Deng Haiyan, Exhibition & Technical
Exchange Dept.
Tel: (86) 1-6093207
Fax: (86) 1-609-3790

Organizer of BCATV '94 exhibition May 23-25, 1994.

China's Domestic Satellite System

On April 24, 1970, China launched its
first satellite, Dong Fong Hong ("The East is
Red"), named after a popular revolutionary
Chinese song. DFH-1 was not a geostation-
ary satellite and was used to transmit mu-
sic rather than video. Taking 114 minutes
to circumnavigate the globe, this low-earth
orbiting was considered to be a failure.

The Chinese government credits former
U.S. President Richard M. Nixon with intro-
ducing satellite TV technology to the People's
Republic of China (PRC). It all started when
U.S. President Nixon visited the PRC in
1972. On February 1, 1972, a huge dish
antenna was installed at the Beijing airport
so that the world could see the historic visit.

Following the visit, the Chinese govern-
ment began to focus its attention on the
development of a satellite communication
system for the country. Satellites were per-

ceived to be an ideal solution to some of the more formidable problems facing the country. The vast distances between the various Provinces of China, the mountainous terrain, and the lack of good roads had previously isolated the country's various regions from one another. However, satellites were about to bridge these divisions.

In 1973, the PRC began to communicate with the world via satellite. On Aug. 16, 1977, PRC officially became a member of the International Telecommunications Satellite Organization (INTELSAT).

In April of 1984, the PRC launched the first of a new series of communications satellites (DFH-2, Flight 1). Located at 125 degrees East Longitude above the earth's equator, DFH-2 used the 6/4 GHz satellite frequency spectrums to receive and retransmit telecommunications signals. A modest first effort, DFH-2 F1 only carried two 8-watt transponders that produced an EIRP of just 23.4 dBW.

In 1985, the Chinese government established the *China Satellite Communication and Broadcasting Co.*—China's sole authorized telecommunications satellite organization. Soon thereafter, China Satellite Communication and Broadcasting Co., began leasing satellite capacity from INTELSAT to communicate both domestically and internationally. A total of fifty-three community antenna TV (CATV) receiving stations were quickly installed across the nation, each measuring 6m in diameter. All of these antennas were made in the People's Republic of China.

In 1986, the PRC began using satellites to broadcast the educational programs of Chinese Central Television in order to enrich the culture of the Chinese people. Also that year, the PRC launched a second DFH-2 satellite to an orbital assignment of 103 degrees East Longitude. One of the differences between the DFH-2 F1 and the newer

DFH-2 F2 satellites was the structure of the newer satellite's antenna. Another difference was a substantially higher transponder EIRP of 34.5 dBW. Both of these satellites have since been retired from service.

Additional DFH-2 series satellites were launched in 1988, 1990, and 1991. "Chinasat A" is the Western name for this series of spacecraft. On March 7, 1988, "Chinasat 1"—China's first truly geostationary satellite to broadcast within PRC—was launched to an orbital position of 87.5 degrees East Longitude. It had an improved antenna structure, an increased mission life (four years), and increased the number of available transponders to four.

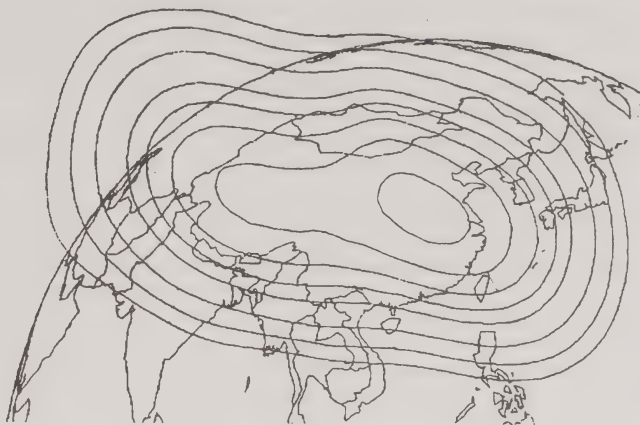
On December 22, 1988, "Chinasat 2" was launched to an orbital position of 110.5 degrees East Longitude and on February 24, 1990, "Chinasat 3" was launched to 98 degrees East Longitude. Although Chinasat 4 was launched on December 28, 1991, a rocket failure prevented it from attaining geostationary orbit.

Even with several Chinasat A series satellites in orbit, the PRC continues to use transponders on satellites built and operated by foreign organizations. The satellites built by the PRC did not have enough capacity to fulfill all the country's domestic needs. These transponders also reach overseas to provide TV and radio broadcast to PRC diplomats and other Chinese audiences living overseas.

As of June, 1993, ten Chinese TV program services were being broadcast from Beijing throughout PRC, S.E.Asia, and the Middle East using Chinasat 1, Chinasat 2, Asiasat 1, and the Russian Statsionar 14 satellite. In July of 1993, the PRC began transmitting TV and radio programs through a new satellite which previously had been purchased from the U.S.-based GTE Corporation called Spacenet 1. The PRC subsequently changed the name of the satellite to

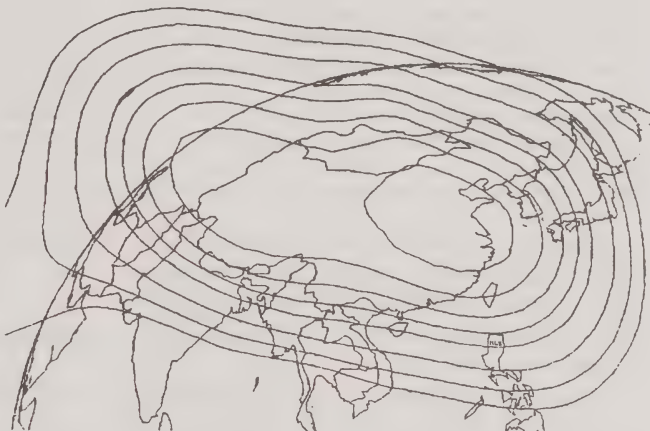
*Chinasat-5 C-band Coverage
Beam (36-MHz Trs.) from
115.5 degrees East Longitude*

EIRP (peak):	37 dBW
1st contour:	36 dBW
2nd contour:	35 dBW
3rd contour:	34 dBW
4th contour:	33 dBW
5th contour:	32 dBW
6th contour:	30 dBW
7th contour:	28 dBW
8th contour:	26 dBW



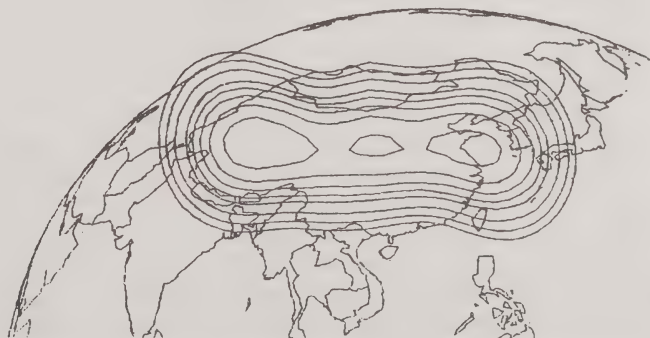
*Chinasat-5 C-band Coverage
Beam (72-MHz Trs.) from
115.5 degrees East Longitude*

EIRP (peak):	38 dBW
1st contour:	37 dBW
2nd contour:	36 dBW
3rd contour:	35 dBW
4th contour:	34 dBW
5th contour:	33 dBW
6th contour:	31 dBW
7th contour:	29 dBW
8th contour:	27 dBW



*Chinasat-5 Ku-band Coverage
Beam (72-MHz Trs.) from
115.5 degrees East Longitude*

EIRP (peak):	45 dBW
1st contour:	44 dBW
2nd contour:	43 dBW
3rd contour:	42 dBW
4th contour:	41 dBW
5th contour:	40 dBW
6th contour:	38 dBW
7th contour:	36 dBW
8th contour:	34 dBW



Chinese Satellite Television Services

CCTV-1, -2, & -3 (Chinasat-115.5E)
 CCTV-4 (Statsionar-96.5E)
 CETV-1 & -2 (Chinasat-110E)
 Chinese Provincial TV (Asiasat)
 Xizang TV-Tibet (Chinasat-115.5E)
 Sichuang TV (Chinasat-115.5E)
 Xinjiang TV (Chinasat-115.5E)
 Guangzhou TV (Chinasat-115.5E)

Chinese Satellite Radio Services

Chinese Provincial Radio (Asiasat)
 Tibetan Radio (Chinasat-115.5E)
 Chinese Radio (Chinasat-115.5E)
 Sichuang Radio (Chinasat-115.5E)
 Chinese Ministry of Radio, Film and Television (MRFT) - PIONEER digital audio broadcast network from Beijing to remote sites including Guangzhou, Shenzhen, Zhongshan
 Shanxi Provincial Broadcast Network - digital audio broadcast network
 Xinjiang Broadcasting Bureau digital audio network uplinked from Urumqi to more than fifty receive sites.

Chinese Voice & Data Services

(INTELSAT and Chinasat satellites)

Ministry of Posts & Telecommunications - Thin Route voice & data
 Ku-band telephony link between China and South Korea
 Urumqi (NW China), Lhasa (Tibet), Hohhot (Mongolia) and Guangzhou (Canton)
 Ministry of Petroleum - VSAT voice & data (Hub station - Gu'an)
 Ministry of Astronautics (SCPC network)
 Shanghai Stock Exchange (SSE) -1,000 site digital satellite audio and data broadcast network for fifty-two sites
 Shanghai Metals Exchange - satellite data broadcast network
 Institute of Tracking and Telecommunication Technology (Mobile Units)
 An Tai Bo Surface Mine at Ping Shuo
 China Xinhua (New China) News Agency (fifty VSAT stations)
 INTELSAT IDR telephony link between Urumqi and Yining

Chinasat 5. Located at 115.5 degrees East Longitude, Chinasat 5 now transmits multiple channels of TV and radio programming, replacing Chinasat 1 which has been retired from service.

In 1994, PRC will launch additional DFH-3 series satellites to carry out the task of transmitting within its territory. If necessary, PRC will continue to use foreign transponders to cover the entire country.

The first DFH-3 satellite is scheduled to be launched in the first half of 1994 to an orbital location of 125 degrees East Longitude. This new C-band satellite will differ from its predecessors in several ways. Among them, the satellite, which is expected to achieve a mission lifetime of eight years, will carry twenty-four transponders, six transmitting with an output power of 16 watts (for TV broadcasts) and eighteen with an output power of 8 watts (for news com-

munications and TV broadcasting).

HONG KONG

Government:	U.K. Colony until 1997, when it reverts to China
Population:	5,920,000
Gross National Product:	US\$ 78 billion
Language(s):	English and Cantonese
Religion:	Buddhist, with 8% Christian minority
Time Standard:	+8 GMT
Currency Standard:	HK\$ (7.67 = US\$ 1)
Video Standard:	PAL (I)
Electrical System:	200 a.c., 50 Hz.
Telephone Country Code:	(852)
Major City Telephone Codes:	None
Number of TV Sets:	2,250,000
Number of Cable Subs:	

INTELSAT REPRESENTATIVE:

Hong Kong Post Office

173 Drs Voeux Road, Central

Hong Kong

Mr. Danny Lau, Senior Telecommunications

Engineer (International Affairs)

Telecommunications Branch

Tel: (852) 541-9681

Fax: (852) 541-9058

INTELSAT OPERATIONS:

Cable & Wireless (London)

Tel: (44) 71-315-5048

Fax: (44) 71-315-5048

Cable & Wireless (Hong Kong)

Tel: (852) 829-1111

Fax: (852) 829-1481

EARTH STATIONS: HONG KONG 1 - 177° E
HONG KONG 2 - 63° E
HONG KONG 3 - 60° E
HONG KONG 4 - 174° E
HONG KONG 5 - 177° E
HONG KONG 6 - 177° E
HONG KONG 7 - 183° E
HONG KONG 8 - 57° E

NATIONAL TELECOMMUNICATIONS ORGANIZATION:

Hong Kong Telecom

P.O. Box 9896, GPO

Hong Kong

Tel: (852) 883-3939

Fax: (852) 882-7759

SATELLITE OPERATORS:

Asia Satellite Telecommunications Co. Ltd.

(Asiasat)

23-24/F., East Exchange Tower

38-40 Leighton Road,

Hong Kong

Lindy Wong, PR Coordinator

Mr. Peter Jackson, Chief Executive Officer

Tel: (852) 805-6666

Fax: (852) 805-6671

Operator of the Asiasat-1 and Asiasat-2 (1995) regional communications satellites.

APT Satellite Company Ltd.

Room 1002, 10/F, Conic Investment Bld.

13 Hok Yuen St.

Hunghom, Kowloon

Hong Kong

Mr. He Ke Rang, President

Mr. Bao Miao Qin, Chief Engineer

Tel: (852) 356-3290

Fax: (852) 773-1050

Operator of the Apstar-1 (1994) and Apstar-2 (1995) regional communications satellites.

GloboStar Satellite Systems Ltd.

1408 Prince's Bldg., 10 Chater Rd.

Central, Hong Kong

T.J. Brewer

Tel: (852) 537-9265

Fax: (852) 845-9175

Subsidiary of Global Information Systems, Inc., operator of the forthcoming GloboStar satellite system to be launched by the Russians beginning in 1994.

Asiasat EIRP/Coordinates:

35 dBW (2.4m TVRO)

Elevation: 62; Azimuth: 202

BROADCAST ORGANIZATIONS:

BBC World Service Television

Apartment 4a, Tower 3

Dynasty Court

23 Old Peak Rd.

Hong Kong

Tel: (852) 810-9341

Fax: (852) 810-9346

ESPN Asia Ltd.

2802-2804 Admiralty Centre

Tower 1, 18 Harcourt Rd.

Hong Kong

Mr. Alexander Brown, Vice President

Tel: (852) 528-3281

Fax: (852) 528-3618

Satellite Television Asian Region Ltd.

(STAR TV) 12th Floor Hutchison House
10 Harcourt Rd.
Hong Kong
Jim Griffiths, Managing Director
Michael Dunlop, Executive Vice President,
Free-to-air TV
Paul Edwards, Executive Vice President,
Pay TV
Tel: (852) 532-1888
Fax: (852) 524-4093

STAR TV is a broadcasting service which telecasts five 24-hour free-to-air channels: Prime Sports, MTV Asia, Chinese Channel, BBC World Service, and Star Plus - the entertainment channel. The service is available in more than thirty-eight countries in the Pan-Asian region from the Middle East to Japan and from the Commonwealth of Independent States to Indonesia. STAR TV will display its five free-to-air channels and their coverage, and will introduce its new pay TV service.

Television Broadcasts Ltd.

Lot 214, Clearwater Bay Road
Kowloon,
Hong Kong
L.S. Ng, Deputy Controller
K.S. Chung, Section Head
(International Operation)
Tel: (852) 719-4828
Fax: (852) 358-0407

Broadcasts Chinese-language TV service via the Palapa B2P satellite.

World Television News (WTN)

1260 Telecom House
3 Gloucester Rd.
Wanchai,
Hong Kong
Tel: (852) 527-9180
Fax: (852) 865-4972

International news organization which provides daily news feeds to broadcasters within the Asia-Pacific Region.

Asiavision Ltd.

c/o 1101 Ruttonjee House
11 Duddell St.
Hong Kong
Urban Carmel, Director
Tel: (852) 525-5751
Fax: (852) 523-5682

Regional news organization which provides daily news feeds to member broadcast stations within the Asia-Pacific region.

**SATELLITE TVRO MANUFACTURERS
AND DISTRIBUTORS:**

Antech Development Ltd.

M P Industrial Centre
1901-1906 Block B
18 Ka Yip Street
Chai Wan,
Hong Kong
Mr. V. R. Derek Cheng, President
Gary Chan, Marketing Manager
John H.C. Li, Field Engineer
Tel: (852) 515-0191
Fax: (852) 898-2199

Products manufactured: direct broadcast satellite antennas; products distributed: antennas, feedhorns, LNBs, Receivers, Coaxial cables; Services: Satellite TV, SMATV, CABD installer and consultant.

Anriga Limited

Unit No. 23-6
23/F, Honor Industrial Centre
No. 6 Sun Yip St.
Chai Wan
Hong Kong
Tel: (852) 558-3038
Fax: (852) 896-0032

Distributor of DX (Japan) TVRO receivers and other TVRO, SMATV, and CATV equipment.

CAD CAM Industries (HK) Ltd.

GPO Box 5264
28, Arbuthnot Road GIT
Central Hong Kong
Mr. Patrick Braun, General Manager
Mr. Enzo Cheung, Assistant Manager
Mr. Dil Akbar, Sales Manager
Tel: (852) 524-2483
Fax: (852) 524-4730

Products manufactured: satellite receivers, satellite signal strength meters; products distributed: head end systems, LNBs, feedhorns, and satellite dishes. Cad Cam Industries (HK) Ltd. specializes in the development and manufacturing of satellite TV equipment for Europe, Asia, and the Americas on an O.E.M. basis. The Hong Kong head office was established in 1989 to manufacture satellite receivers mainly for the European market. All research and development is carried out in Germany in CCI's research center. CCI currently manufactures a wide range of satellite receivers starting from simple sixteen channel models to receivers capable of accessing 408 channels.

City Science Company

63 Oak Street
2nd Floor, Flat B-6
Tai Kok Tsui
Kowloon,
Hong Kong
Mr. Chai Wah Tak, Proprietor
Tel: (852) 787-3059
Fax: (852) 381-0728

Echosphere Corp. - Asian Division

Unit B block A
Wo Kee Hong Bldg.
585-609 Castle Peak Rd.
Kwai Chung, N.T.
Hong Kong
Zhang Hai Ming, Director of Operations
Tel: (852) 494-8823
Fax: (852) 494-8855

Manufacturer and distributor of satellite TV and SMATV products.

England Optical (HK) Manufactory Ltd.

Seaview Estate
Block B Room 1208
North Point,
Hong Kong
Mr. Hung Siu Cheung, Director
Tel: (852) 566-1151
Fax: (852) 898-2199

Gardiner Communications Corp.

Room 4507A
Metroplaza Tower 2
223 Hing Fong Rd.
Kwai Chung, N.T.
Hong Kong
Mr. Horace Chui, Regional Manager

Tel: (852) 420-7081
Fax: (852) 489-1492

Products manufactured: LNBs, feedhorns, receivers, MMDS downconverters; products distributed: LNBs, feedhorns, receivers, MMDS downconverters.

Hong Kong Satellite Television Ltd.

14/F, Fu Lee Commercial Building
14-20 Pilkem St. Kowloon,
Hong Kong
Eddie L. F. Chan, General Manager
Tel: (852) 735-0583
Fax: (852) 736-8703

Distribution and sales of satellite TV equipment.

Hunsonburg Enterprises Co. Ltd.

V Huen Building
19th Floor
138 Queen's Central Road
Central Hong Kong
Mr. M. K. Tang, Sales Manager
Tel: (852) 542-0666
Fax: (852) 854-0255

Intro-Tech Technology Ltd.

Wah Ying Cheong Bldg.
10th Floor, Room 1001B
162 Queen's Rd. Central
Central Hong Kong
Mr. Larry Kwong, Manager
Tel: (852) 544-8819
Fax: (852) 544-8202

Pace Micro Technology (Asia)

Suite 113 Central Bldg.
1 Peddler St.,
Central Hong Kong
Keith Wiggins, Group General Manager,
Sales and Marketing
Tel: (852) 841-7809
Fax: (852) 841-7722

Manufacturer of satellite TV integrated receiver/decoders (IRDs), satellite receivers, VideoCrypt decoders, Cryptovision IRDs and decoders, and antenna positioners. Pace Micro Technology, the largest producer of satellite TV receivers manufactured within Europe, has now established a regional office in Hong Kong to introduce a product range tailored to local market requirements and to establish a comprehensive distributor network. The Pace range includes the PSR818 and PSR 919 dedicated C-

band satellite receivers which incorporate an 18/27 MHz switchable tuner, phono sockets and a Pulse PSU switchmode power supply designed to tolerate variations in the main a.c. electricity supply. In addition, Pace manufactures SMATV systems and a range of products to support the Cryptovision Pay TV system.

Pacific Downlink Co. Ltd.

G.P.O. 2903

Hong Kong

Mr. Steve Malarski, CEP

Mr. S. Chim, Director

Mr. R. Ko, PR Director

Mr. J. Lim, Development Manager

Tel: (852) 764-9291

Fax: (852) 764-6396

Manufactures and distributes satellite TV products.

Pacific Satellite International Ltd.

16/F, Block B, Cheung Lee Industrial Bldg.

9 Cheung Lee Street, Chai Wan

Hong Kong

Joseph Yeung, Director

Tel: (852) 898-1382

Fax: (852) 558-0406

Distribution and sales of satellite TV equipment.

Pagun International Co.

G.P.O. Box 359

165 Wanchai Rd. Suite 1706

Wanchai,

Hong Kong

Gregory Brooks

Tel: (852) 572-8000

Fax: (852) 572-0201

Pan Asian Systems Ltd.

LG4 Cavendish Centre

23 Yip Hing Street

Wong Chua Hang

Hong Kong

Paul Bustin, Managing Director

Michael Peach, Technical Director

William Wade, Regional Director (Pacific Rim)

Altaf Alimohamed, Regional Director (India, Middle East)

Tel: (852) 873-9777

Fax: (852) 555-1589

Products distributed: cable, connectors, LNBs, receivers, modulators, amplifiers, accessories, MMDS

equipment, feedhorns, antennas; services provided: system design, technical consulting, installation, commissioning turn-key projects.

Pan Asian Systems provides a complete range of product and engineering services for all aspects of satellite and cable television. The company product range includes TVRO, CATV, SMATV, and MMDS. PAS has a large and experienced engineering team in Asia, with projects completed in Hong Kong, China, Malaysia, Philippines, India, and the Middle East. PAS is headquartered in Hong Kong and has regional offices in China, Philippines, Dubai, and India. With this extensive network, product and engineering services can be provided across an area stretching from Japan to the Middle East. Pan Asian Systems is a member of the Hutchison Whampoa Group of Companies.

PRS Corporation

501 Crocodile House

50 Connaught Rd.

Hong Kong

Pierre R. Schwob, President

Mark J. Abouzeid, CFO

Tel: (852) 543-7773

Fax: (852) 541-9843

Licensing of proprietary tuner/receiver technologies (ID logic).

Shun Hing Technology Co., Ltd.

9th Floor, Peninsula Centre

67 Mody Rd.

Tsmshatsu East, Kowloon

Hong Kong

Tel: (852) 313-0888

Fax: (852) 368-8058

Skawol (Hong Kong) Ltd.

G/F, 12-14 Sam Chuk Street

San Po Kong, Kowloon

Hong Kong

Mr. Choi Oi Lai, Group Managing Director

Mr. Choi Oi Wing, Managing Director (Hong Kong)

Ms. Li Fung Yin, Administration Officer

Ms. Ming Siu Way, Executive Assistant

Tel: (852) 351-6381 (12 lines)

Fax: (852) 351-5607 -5630 -8152

Products distributed: Agency of KTI (all mesh type antenna dish), LNBs (Chaparral/Gardiner/California Amplifier/MTI), feedhorns (Chaparral/Jonsa), receivers (Chaparral/Drake/Echostar/Skawol), ac-

tuators (Jaeger), cables and other types of TVRO equipment. Also provides SMATV and CATV equipment.

Skawol Group has been established for several years with offices located in Hong Kong, Thailand, Macau and China, and are engaged in representing and trading through several specialized divisions. Skawol (Hong Kong) Ltd., is a member of Skawol Group with business line concentrated in electro-telecommunication equipment. Following the popularity of satellite TV reception, they started two years prior to the Launch of Asiasat 1, taking the lead in representing several satellite TV product lines from other parts of the world.

Sun Satellite Television Services Ltd.

Unit 4601, Tower 1, Metroplaza
223 Hing Fong Rd., Kwai Fong
Hong Kong
Albert K.K. Lee, Technical Manager
Tel: (852) 422-7777
Fax: (852) 418-0626

Satellite TV distribution and sales.

Zindex Company

Hang Lung House
14th Floor
184-192 Queen's Rd.
Central
Hong Kong
Mr. Soong Kai Shau, Proprietor
Tel: (852) 543-2896
Fax: (852) 541-6255

SATELLITE CONSULTING:

Patch Communications

Asia-Pacific Ltd.

G/F, flat E, 2-8A Happy View Terrace
Happy Valley,
Hong Kong
Simon Patch
Tel: (852) 890-2477
Fax: (852) 890-6768

TELECOM PUBLICATIONS:

Asia Pacific Space Report

Room 1301, 13/F,
Park Commercial Centre
6-10 Shelter St.
Causeway Bay
Hong Kong

Brian Jeffries, Editor
Tel: (852) 577-9331
Fax: (852) 890-7287

Publishes a monthly newsletter on the communications satellite and commercial space industries within the Asia-Pacific Region.

CCI Asia-Pacific Ltd.

Suite 905, Guardian House
32 Oi Kwan Rd.
Happy Valley,
Hong Kong
Thomas D. Gorman, publisher
Tel: (852) 833-2181
Fax: (852) 834-5620

OTHER:

Lehman Brothers

One Pacific Place
88 Queensway,
Central Hong Kong
Mr. Phillip Lynch, Senior Representative
Tel: (852) 846-0733
Fax: (852) 526-9516

The Satellite Company

165 Wanchai Rd.
Wanchai,
Hong Kong
Gunnar Helgason
Tel: (852) 572-8000
Fax: (852) 572-0201

PAY-TV

PAY TELEVISION SYSTEMS FOR HOTELS AND APARTMENT COMPLEXES

AZIMUTH's Hotel Information/Messaging/Pay-TV Systems are the market leader. Why upgrade older TV's when our system converts them into fully remote controlled 62 channel sets! Facilities include Information Services, Individual On-Screen Messages, Folio-Bill Checking and Express Check Out.

Azimuth (Far East) Ltd, 5 Wangjing
Zhonghuan Nanlu, Chaoyang District,
Beijing, P.R. China 100015
Tel: +(86) [1]-436-1868 Fax: +(86) [1]-436-1891

INDIA



Government: Federal Republic
 Population: 900,000,000
 Gross National Product: US\$ 324 billion (1993 estimate)
 Language(s): Hindi, English, Telugu, Bengali, Marathi, Urdu, Gujarati
 Religion: Hindu, with 11% Muslim minority
 Currency: Rupee (30.80 = 1US\$)
 Time Standard: +5:30 GMT
 Video Standard: PAL B
 Electrical System: 230/400 a.c., 50 Hz.
 Telephone Country Code: (91)
 Major City Telephone Codes:

New Delhi - 11
 Bombay - 22
 Calcutta - 33
 Madras - 44
 Jaipur - 141
 Pune - 212
 Surat - 261
 Ahmadabad - 272
 Madurai - 452
 Kanpur - 512
 Indore - 731
 Bangalore - 812

Number of TV Sets: 50,000,000

INTELSAT/INMARSAT REPRESENTATIVE:

Videsh Sanchar Nigam Ltd.

Videsh Sanchar Bhavan
 Bombay 400 001
 India
 Mr. S.P. Aggarwai, General Manager
 Tel: (91) 22-262-4073
 Fax: (91) 22-262-4321
 Main Tel: (91) 22-277-450
 Main Fax: (91) 22-954-321

EARTH STATIONS: AHMED - 63° E
 BANGALORE - 63° E
 BANGALORE 2 - 63° E
 BANGALORE 3 - 63° E
 BANGALORE 4 - 63° E
 BOMBAY - 359° E
 GANESHPURI TVRO - 66° E
 (GURUDEV SIDDHA PEETH)
 MADRAS 3 - 63° E
 NEW DELHI 2 - 63° E
 VIKRAM 1 - 359° E
 VIKRAM 2 - 60° E

INMARSAT AARVI (IOR)

In addition to the above-mentioned international earth stations, India also has more than 40 domestic earth stations which interface using the INTELSAT satellites at 60 and 63 degrees East Longitude.

Asiasat EIRP/Coordinates:
 New Delhi: 37 dBW (1.8m TVRO)
 Elevation: 45; Azimuth: 132

SATELLITE ORGANIZATIONS:

Department of Space

Government of India
 F-Block, Cauvery Bhavan
 Kempegowda Rd.
 Bangalore 560 009
 India

Indian Space Research Organization (ISRO)

Antariksh Bhavan, New BEL Rd.
 Bangalore, 560 094
 India
 Tel: (91) 812-334-301
 Fax: (91) 812-332-292

BROADCAST ORGANIZATIONS:**Asia TV Network**

1st Floor, Safdarjung Enclave
Africa Avenue
Bombay 400001
India

Doordarshan 1 - 4

Mandi House
Copernicus Marg
New Delhi 110001
India
Tel: (91) 11-387-786
Fax: (91) 11-386-507

SATELLITE COMPANIES:**Allied Communications**

19, C.S.C Complex
DDA Flats
Sukhdev Vihar, New Delhi
110025 India
V. Vikki Choudry, Prop.
R. Choudhry, R & D Chief
Tel: (91) 11-683-9615, 636-208
Fax: (91) 11-683-4630, 683-5403

Products manufactured: satellite receivers, adjacent channel modulators, combiners, headend amplifiers, line extenders; products distributed: LNBs, antenna str., coaxial cables, line equipment, and signal level meters; services provided: Our company is the oldest cable TV network in Delhi with a large number of subscribing households. In the course of time it started manufacturing cable TV equipment and gave technical consultancy to newly set-up networks in and around Delhi. Their services are provided to about 600 networks in and around Delhi.

ARIES Electronics Agencies Pvt Ltd.

201, Raghava Cottage
Dwarakapuri Colony, Panjagutta
Hyderabad, 500482 India
B.V.K. Raju, Marketing Director
V. Sreenath Rao, Director
B. Srikanth, Manager, Technical
Tel: (91) 842-221-317, 228-601
Fax: (91) 842-212891

Products manufactured: satellite antennas, trunk and distribution, amplifiers, cable distribution hardware; products distributed: satellite reception sys-

tems, cable, cable TV distribution hardware, CATV systems; services provided: technical consultancy, TV software, turn-key cable TV systems. Business activities include the marketing and installation of satellite reception systems, LNB, C & S-band antennas, satellite receivers, SMATV/CATV systems, cable and cable TV distribution equipment, and test equipment. The company is backed by a large team of highly trained and motivated professionals. The area of business is South India comprising the States of Andhra Pradesh, Maharashtra, Orissa, Karnataka and Tamilnadu.

Automech India Pvt. Ltd.

Motiwala Bldg., 1st floor
Dr. Proctor Rd., Near Hotel Grant
Grant Rd. (E)
Bombay 400007 India
Tel: 386-7125

Manufacturer/distributor of satellite TV receivers and dish antennas.

Channel Master

Shop No. 3A
Jyoti Estate
54-C, Proctor Rd.
Off Lamington Rd.
Bombay 400007 India
Tel: 387-9390, 388-7275

Distributor of satellite TV equipment.

City Channels

Door No: 60-C, Robertson road
R.S. Puram (West)
Coimbatore 641002 India
K.R. Kumar, consultant and CATV operator
Tel: (91) 422-852-342
Fax: (91) 422-852-342

Services: technical consultant in erection of satellite TV dish antennas and CATV distribution.

Dixit Associates

27-24 K.M. Naskar Rd.
Calcutta India
Dixit Vinay, Partner
Dixit Sanjay, Partner
Tel: (91) 33-724-895, 266-936
Fax: (91) 33-766-964

Products distributed: MATV/CATV Systems, including LNBs, feedhorns, antennas, receivers, ac-

cessories, satellite modems and TV boosters.

Electronic Services

Head Post Office Road

Paighat

Kerala 678001 India

Peter R. J., Prop.

Tel: (91) 491-26626, 55426

Products manufactured: satellite reception systems for L, S, and C-band; services provided: technical assistance to cable TV and satellite reception systems; repair and maintenance of systems including VCRs.

FLTEC Electronics

304, Alankar Ind. Estate

Off Aarey Road

Goregaon (East)

Bombay 63 India

Tel: 888-4467, 889-5778

Provides complete satellite receiving, SMATV and CATV systems.

High Communications

No. 217, Sharadi Colony

Basaveswaranagar

Bangalore 560 079 India

K.M. Ansar, Chief Executive

Tel: 335-1938

Fax: 221-6165

Products manufactured: TV signal distribution amplifiers, satellite receivers, and dish antennas; products distributed: cables and accessories. All products manufactured by High Communications are marketed under the name of Hycom through a distribution network consisting of appointed dealers in major cities and through a successful Direct marketing network in Bangalore city. (The company recently changed its name from Phoenix Systems to High Communications.)

I.S.N. Corporation

Flat 2E Montieth Court

69 Montieth Road, Egmore

Madras 600 008 India

Harish Bhaskar, Director Marketing

Hemanth Bhaskar, Director Technical

Tel: 826-8118

Products manufactured: C-band antennas, both fixed and motorized, ranging from 1 meter to 19

meters in diameter. The company also operates cable TV networks in the Southern part of India in the name of Multi-Channel Satellite Networks and Communication. ISN's range of satellite products will be expanded in 1994 with the manufacture of an uplink antenna.

Kalyani Mercantile Co.

17, Garden Society, Gangapur Road

Nasik 422-002 India

Mukund Holkar, Executive Director

Tel: (91) 253-70089

Fax: (91) 253-71600

Products manufactured: antennas and receivers; products distributed: receivers, antennas, LNBs, feedhorns, and accessories; services provided: technical consulting, satellite TV or radio program services and videoconferencing services.

Lotus Cine Pvt Ltd.

D-402, Defence Colony

New Delhi 110024 India

Rajiv Tulshan, Director

Manoj Tulshan, Director

P.K.S. Nair, Executive - Exports

R.C. Tiwari, Executive - Local

Tel: (91) 11-462-4983

Fax: (91) 11-462-4708

Products manufactured: modulators/amplifiers; products distributed: dish antennas, receivers, LNBs, feedhorns, splitters, and tap offs; services provided: makes computer programs for cable operations.

Modern Communications and Broadcast Systems Pvt. Ltd.

93, Madhuban Towers

Ellisbridge, Ahmedabad 380006

(Gujarat) India

Tel: 401821

Fax: 02712, 20585

Satellite antennas, receivers, feedhorns, multichannel satellite receiving systems, and cable TV headend products.

M/S Kassonics

Pinto Apartments

Pe Jose Vas Rd.

Vasco de Gama GOA India

Alexander Fernandes, Partner

Tel: 2146, 3459

Fax: (91) 834-513-508

Products distributed: dish antennas eight to 24 feet in diameter, TVRO, MATV, CATV headend equipment, accessories and other network hardware; services provided: turnkey projects for MATV, CATV systems and maintenance contracts. In 1990, the company began installing satellite antennas, both fixed and motorized, up to 20 feet in diameter for Catvision Products Ltd. The company accepts turnkey projects for TVRO, MATV, and CATV systems, provides maintenance services for large installations, and offers consultancy services for the design and installation of CATV Network/Systems.

M/S U.M.S. Factory (P.) Ltd

Gopal Bagh, 317 Avanashi Road
Colmbatore 641 018 India
G.D. Gopal, Managing Director
Bobby Chengappa, Executive Director
Khaja Mohiddin, Factory Manager
Tel: (91) 422-213377/78
Fax: (91) 422-212760

Products manufactured: Dish antenna with or without polar mount, satellite receivers, channel modulators, linear actuators, channel mixers, feedhorns, and CATV accessories.

Nagare Electronics

386, M.H.B. Colony
Satpur, Nasik 422 007 India
D.K. Nagare, Proprietor
Tel: (91) 253-71206
Fax: (91) 253-77213

Products manufactured: satellite receivers, RF modulators, dish antennas, SMRs for satellite receiver channel converters, field strength meter (VHF) and L-band LNAs.

N.G. Electronics

B-249 Okhla Industrial Estate Phase I
New Delhi 110020 India
Tel: (91) 11-681-1625, 681-9162
Fax: (91) 11-681-9403

Products distributed: satellite receivers, adjacent channel modulators, equalizers, splitters and taps.

Orbit TVRO System

135, Kamarajar Salai
Santhapettai, Madurai
625 009 India
T. Kahilan
Tel: 38549 Fax: 43795

Push Electronics

52-D, Jyoti Estate
Grant Rd.
Bombay 7 India
Tel: 387-3266

Manufactures satellite and cable TV product lines.

S.K. Products

"Shiyani Chambers"
Kothariya Main Road
Rajkot 360002 India
Tel: 83399

Manufactures satellite antennas and C-band feedhorns.

Scientific MES-Technik Pvt. Ltd.

B-14, Industrial Estate
PoloGround, Indore 452003 India
Tel: (91) 731-33845, 452003
Fax: (91) 731-491641

Spectrum analyzers for satellite and cable TV applications.

Silton Electronics

Calcutta 700 016 India
Abdul Kader, Proprietor
Tel: (91) 33-291-136
Fax: (91) 33-291-713

Products manufactured: dish antennas 4, 6, 8, 10 and 12 feet in diameter), receivers, modulators, amplifiers, tap-offs, splitters, and other accessories.

Skywaves

71, Laxmi Niwas, Gr. Floor
Road No. 25, Sion (W)
Bombay 22 India
Tel: 407-5960, 407-4974
Fax: 407-2240

Skywaves manufactures an extensive line of satellite reception products for cable operators and townships.

Star Vision

77 Bai Nigayam, Brooke Bond Rd.
Colmbatore 641 001, Tamil Nadu, India
Samuel Isiah, Proprietor
R. Dharani Kumar, Manager
Tel: (91) 422-48373
Fax: (91) 422-212-957

Products distributed: dish antennas, LNBs, feedhorns, receivers, coaxial cables, actuators, amplifiers, modulators, adjacent channel modulators, and other SMATV, CATV equipment; services provided: technical consulting in the areas of TVRO, SMATV and CATV systems.

Transcom

33 Electronic Cooperative Estate
Pune Satara Rd.
Pune, India
S.M. Hardikar, Partner
U.V. Vaidya, Partner
Tel: 432-438, 432-488
Fax: 435-509

Products manufactured: head end and distribution equipment for CATV/MATV. Transcom is part of the Diamond Group of companies which manufacture various electronic and engineering products under the band name Diamond. Transcom employs 80 people and has approximately 4,000 sq. feet of manufacturing space in the Electronic Estate in Pune, which is 150 kilometers from Bombay and easily accessible by train or car.

Tunewell Electronics Pvt. Ltd.

73-74, Parasrampur Tower-2
Lokhandwala, Andheri (W)
Bombay 400058 India
Tel: (91) 22-627-0416, 872-4683, 873-5026
Fax: (91) 22-627-0416

Distributor of satellite and cable TV products.

Unicom Skytech Ltd.

Kartar Mansion, 1st floor
Opp. Ashok Hotel
34-A, Tribhuvan Rd. Off. Lamington Rd.
Bombay 400007 India
Tel: 388-0226, 367-7720

Manufactures 5, 6, 8, 12, and 16-foot mesh and fibreglass dish antennas.

Uniplast Industries

D-1 Atlas Mill Compound
220 Reay Rd.
Bombay 400 010 India
Aslam Abdul Hamid, Partner
Abdul Qayyum, Partner
Tel: (91) 22-372-1861, 376-3115
Fax: (91) 22-378-2644

Products manufactured: coaxial cables for satellite antennas in foam, airspace and solid dielectric.

U.V.C. Satellite Systems

3-1-405, Adj. Lane "Sar Photo Studio"
Nimboli adda, Kachiguda
Hyderabad 500 027 India
B. Mohan Sinah
Tel: 46789, 86934

NIG

DISH ANTENNAS
ADJ. CHANNEL MODULATORS
MIXERS
REMOTE RECEIVERS
T. V. SIGNAL BOOSTERS
T.V. ANTENNAS
VOLTAGE CORRECTORS



BLAZE
Marketing Pvt. Ltd.

A-227, OKHLA INDUSTRIAL AREA,
PHASE-1, NEW DELHI - 110 020
TEL.: 011-681-9381 • FAX : 91-11-681-9403

UNIPLAST

**Manufacturers of
Wires & Cables
Low Loss
Co-Axial Cables**

For Dish Antenna with Aluminium foil in
Air-Space or Solid Di-electric.

RG-11, RG-9, RG-59

Manufactured by :
UNIPLAST INDUSTRIES

D-1, First Floor, Atlas Mill Compound,
220, Reay Road, Bombay - 400 010.
Tel : 372 1861 / 376 3115

The Insat Satellite System

The Indian National Satellite (Insat) program is a joint venture between the Indian Department of Space, the Posts and Telegraphs, the Department of the Ministry of Communications, the India Meteorological Department of the Ministry of Civil Aviation, and the All India Radio and Doordarshan of the Ministry of Information and Broadcasting.

India's first telecommunications satellite was launched into geostationary orbit on April 10, 1982. A series of anomalies forced India to deactivate its Insat 1A satellite just four months after it achieved operational status. On August 30, 1983, Insat 1B was launched into space. This satellite reached the end of its seven-year operational life in 1990. A third satellite, Insat 1C, also failed in orbit and is no longer operational.

On June 12, 1990, a McDonnell Douglas Delta rocket launched India's Insat 1D satellite into space from the Cape Canaveral Air Force Station in Central Florida. Insat 1D was manufactured by Ford Aerospace (Space Systems/Loral). The spacecraft, which has an estimated ten-year mission lifetime, is located at 82.9 degrees East Longitude, where it provides telecommunications and TV capacity, collects data from remote monitoring sites, and conducts meteorological surveys.

Insat 1-D Technical Description

Insat 1D carries twelve transponders for domestic telecommunications, two S-band transponders for direct television broadcasts, and a radiometry payload that generates meteorological images and transmits them back to Earth. Insat 1D employs a biased-momentum three-axis stabilized spacecraft design with a precision attitude control system that provides high attitude stability for the spacecraft's meteorological

imaging mission. The satellite uses an asymmetrical solar array offset by a solar sail that structurally balances the satellite in the face of subtle pressure induced by solar winds. This configuration enables the satellite to obtain a clear field of view into cold space for the Very High Resolution Radiometer (VHRR) Earth imaging instrument.

The VHRR earth imaging instrument photographs a complete view of the Earth every thirty minutes for meteorological analysis. These regular weather pictures have improved India's weather forecasting techniques dramatically by enabling meteorologists to predict the appearance of potentially devastating tropical cyclones.

A small UHF antenna array mounted on the Earth-viewing face of the satellite receives meteorological, hydrological, and oceanographical data from 110 unattended, land- and ocean-based data collection platforms located throughout the country. This data is retransmitted automatically to New Delhi.

Insat 1-D Frequency Plan

Tr.#	Uplink/Downlink
1[1]	5955/3730 MHz
2[3]	5995/3770 MHz
3[5]	6035/3810 MHz
4[7]	6075/3850 MHz
5[9]	6115/3890 MHz
6[11]	6155/3930 MHz
7[13]	6195/3970 MHz
8[15]	6235/4010 MHz
9[18]	6285/4060 MHz
10[20]	6325/4100 MHz
11[22]	6365/4140 MHz
12[24]	6405/4180 MHz
S1	LP-5875/2575 MHz
S2	LP-5915/2615 MHz

INSAT 2 Satellites

The INSAT 2 series spacecraft are second-generation communications satellites designed and constructed by a team comprised of various Indian aerospace manufacturing concerns. The first satellite of this series, INSAT-2A, was launched by Arianespace on July 9, 1992, to an orbital assignment of 74 degrees East Longitude. INSAT-2B was launched by Arianespace on July 23, 1993, to 93 degrees East Longitude.

The INSAT-2 space segment in the 1990s has to support much larger user demands than the INSAT-1 space segment. The total telecommunications capacity required will be about three times the amount the INSAT-1 series spacecraft were able to support. For example, the advanced meteorology requirements demanded better resolution, necessitating an improvement in the meteorological payload. Broadcast requirements also show large growth. A 406 MHz Search & Rescue transponder for immediate detection of 406 MHz alert/distress signals also has been added to the design of the INSAT-2A and -2B satellites.

The INSAT-2 spacecraft are about 50 percent heavier than the INSAT-1 series satellites. Each INSAT-2 spacecraft will weigh about 860 kg in orbit at the end of life (EOL). The satellite's solar panels are sized to generate approximately 1,180 Watts power at EOL (Summer solstice).

Three-axis body-stabilization of the satellite is achieved through the use of bipropellant micro thrusters and Momentum/Reaction Wheels.

INSAT 2 Telecommunications Payload

Each INSAT-2 spacecraft has about a 50 percent higher capacity than any of the first generation INSAT-1 series satellites: eighteen C-band and Extended C-band FSS transponder channels; two high-power S-

band transponder channels; a Data Relay Transponder, a 406 MHz search and rescue transponder, and a Very High Resolution Radiometer with improved (2 kms visible and 8 kms IR) resolutions. While the S-band transponder channels have the same 50 watt TWTA used by all INSAT-1 series spacecraft, Solid State Power Amplifiers (SSPAs) are used in all C-band/Extended C-band output stages. Insat 2-A and Insat 2-B use orthogonal senses of linear polarization for their C-band payloads so that at some future date the two satellites could be collocated at one orbital position without sacrificing available transponder capacity.

The antenna platform consists of two deployable 1.77m parabolic C/S antennas, one 0.9m parabolic C x C antenna, one 0.75m length UHF receiver antenna, a fixed TT&C omnidirectional antenna, and a 0.3m diameter fixed horn antenna. A 900mm antenna fixed to the body on the Earth-viewing face of the spacecraft performs the C-band receive and DCS, VHRR, and S&R data transmit functions.

The INSAT Master Control Facility (MCF) at Hassan has been augmented for the INSAT-2 satellite program. Two 11m Satellite Control Earth Stations and an INSAT-2 Satellite Control Center (SCC) are being added together with VHRR on-orbit test and checkout facilities.

INSAT Telecommunications Traffic

Insat satellites are spacecraft with multiple missions. They transmit long-distance telecommunications traffic, including telephony, data, and facsimile. Insat 1D conducts round-the-clock meteorological earth observations, and transmits Indian educational and cultural TV services to rural communities via a network of low power TV stations and more than 2,000 S-band Direct Reception Sets (DRSs). Regional and national radio services originating from New

Insat 1-D At AGlance

Operational History

Orbital Assignment:	83 degrees East Longitude
Launch Date(s):	June 12, 1990
Launch Vehicle:	NASA Space Shuttle & Arianespace
Status:	Domestic satellite for India
Design Life:	10 years

Communications Payload

Frequency Band(s):	Receive: 5.935~6.425 GHz 5.855~5.935 GHz (Data Collection): 402.75 MHz Transmit: 3.710~4.200 GHz 2.555~2.635 GHz (Data Collection): 4.0381 GHz † (VHRR Radiometer): 4.03455 GHz [400 kb/s data rate]
Channels:	C-band: 12 channels S-band: 2 channels
Channel Bandwidth:	C & S-band: 36 MHz Data Collection: 200 kHz
Channel Polarization:	Linear
Antenna Coverage:	Indian subcontinent
Signal Power (in EIRP):	C-band: 32 dBW minimum S-band: 42 dBW minimum Data Collection: 19 dBW per multiple carrier
VHRR:	8.5 dBW
TWTA Power:	C-band: 4.5 watts S-band: 50 watts
Capacity:	12,000 one-way voice/data channels and two high-power TV signals

Spacecraft

Satellite Type:	Ford Aerospace three-axis stabilized
Mass in Orbit:	1,089kg (2400.8 lb)
Maximum (deployed)	
Dimensions:	19.4m (63.6 ft) from the tip of the solar sail to the end of the solar arrays
Main Body:	2.18 (7.5 ft) x 1.55m (6.1 ft) x 1.42m (4.7 ft)
Telemetry Beacons:	4.031 & 4.039 GHz
Command:	6.258 & 6.262 GHz

The VHRR Radiometer also optically receives visible and infrared light images. The visible channel receives 0.55 - 0.75 μ -meters while providing 2.75 km resolution. The infrared (IR) channel receives 10.5~12.5 μ -meters providing 11 km resolution.

In addition to educational and cultural TV programming, the S-band DBS channels also carry a five-channel radio service, satellite retransmission of meteorological pictures, and a cyclone disaster warning service.

Delhi, Bombay, Calcutta, and Madras also are distributed to a network of ninety-two affiliate stations within the country.

Insat's Doordarshan TV program services are directed to clusters of contiguous districts in the states of Andhra Pradesh, Bihar, Gujarat, Maharashtra, Orissa, and Uttar Pradesh. More than 8,000 community reception centers have been established within these areas. An additional

6,600 communities receive these satellite TV services from four VHF TV rebroadcasting transmitters located at Gorakhpur, Nagpur, Rajkot, and Ranchi.

Contel ASC has provided India with 1,000 VSATs for a national business network. The network uses Contel's two-way DMN VSATs to provide data transmissions nationwide and expand the Indian telex network to include remote areas of the country.

INSAT-2A & -2B At A Glance

Communications Payload

Frequency Bands:	Uplink:	5.850-5.930 GHz
		5.930-6.430 GHz
		6.735-6.975 GHz
	Downlink:	2.550-2.630 GHz
		3.700-4.200 GHz
		4.510-4.750 GHz

Fixed Satellite Services: 12 C-band and 6 Ext. C-band transponders (16 Trs. ~ 32 dBW and 2 Trs. ~ 34 dBW)

Broadcast Satellite Services: 2 S-band transponders (42 dBW)

Meteorological Services: VHRR with 2 km resolution in visible and 8 km resolution in IR band

Data Relay: 400 MHz uplink, Ext. C-band down link

Satellite-Aided Search & Rescue: 406 MHz uplink, Ext. C-band down link

Spacecraft Specifications

Spacecraft type:	Three-axis stabilized
Manufacturer:	Indian Space Research Org. (ISRO)
Weight at Lift-off:	1906 kg
Dry Mass:	905 kg
Main body dimensions:	1.9m x 1.6m x 1.7m
Total Length in orbit:	23m
Solar Sail/Boom:	1.5m dia. x 4.4m Solar sail attached to 14.95m deployable boom to counteract solar torque imbalance due to solar array
	15.5 sq. m consisting of 3 panels of 3.9 sq. m each and 2 panels of 1.9 sq. m each generating 1024 W. Transfer orbit power provided by outermost stowed panel.
Solar Array Power:	

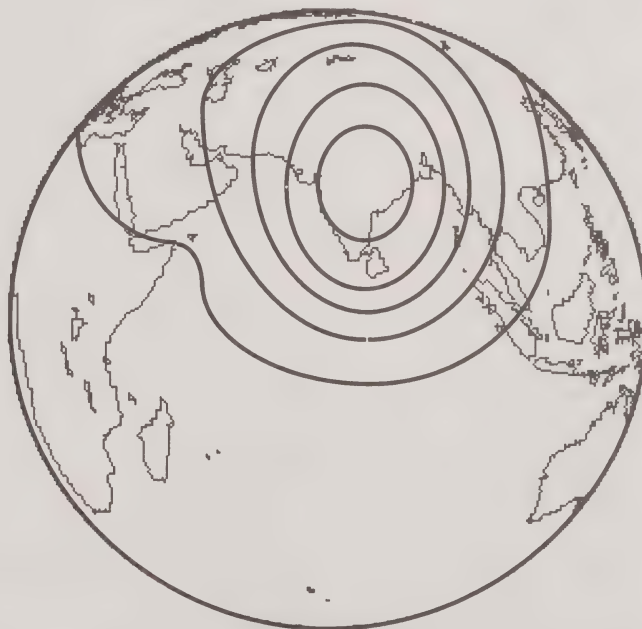
Insat 2-A Frequency Plan

Tr.#	Pol.	BW	Uplink/Downlink
1[1]	H	36	5950/3725 MHz
2[3]	H	36	5990/3765 MHz
3[5]	H	36	6030/3805 MHz
4[7]	H	36	6070/3845 MHz
5[9]	H	36	6110/3885 MHz
6[11]	H	36	6150/3925 MHz
7[13]	H	36	6190/3965 MHz
8[15]	H	36	6230/4005 MHz
9[17]	H	36	6270/4045 MHz
10[19]	H	36	6310/4085 MHz
11[21]	H	36	6350/4125 MHz
12[23]	H	36	6390/4165 MHz
13	H	36	6755/4530 MHz
14	H	36	6795/4570 MHz
15	H	36	6835/4610 MHz
16	H	36	6875/4650 MHz
17	H	36	6915/4690 MHz
18	H	36	6955/4730 MHz
S1	H	36	LP-5870/2570 MHz
S2	H	36	LP-5910/2610 MHz

Insat 2-B Frequency Plan

Tr.#	Pol.	BW	Uplink/Downlink
1[2]	V	36	5970/3745 MHz
2[4]	V	36	5110/3785 MHz
3[6]	V	36	6050/3825 MHz
4[8]	V	36	6090/3865 MHz
5[10]	V	36	6130/3905 MHz
6[12]	V	36	6170/3945 MHz
7[14]	V	36	6210/3985 MHz
8[16]	V	36	6250/4025 MHz
9[18]	V	36	6290/4065 MHz
10[20]	V	36	6330/4105 MHz
11[22]	V	36	6365/4140 MHz
12[24]	V	36	6395/4170 MHz
13	V	36	6755/4530 MHz
14	V	36	6795/4570 MHz
15	V	36	6835/4610 MHz
16	V	36	6875/4650 MHz
17	V	36	6915/4690 MHz
18	V	36	6955/4730 MHz
S1	V	36	LP-5870/2570 MHz
S2	V	36	LP-5910/2610 MHz

*Insat 2-A C-band
Coverage Beam
from 74 degrees
East Longitude*



EIRP (peak): 36 dBW
 1st contour: 34 dBW
 2nd contour: 32 dBW
 3rd contour: 30 dBW
 4th contour: 26 dBW
 5th contour: 16 dBW

INDONESIA



Government: Republic
 Population: 200,600,000
 Gross National Product: US\$ 101.4 billion
 (1993 estimate) Language(s):
 Javanese,
 Sundanese, Malay
 and English
 Religion: Muslim, with 9%
 Christian minority
 Currency: Rupiah
 (2,074 = 1US\$)
 Time Standard: +7 GMT, GMT+8 in
 Ujung Pandang,
 Banjarmasin,
 Pontianak, &
 Manado;
 GMT+9 in Jayapura
 Video Standard: PAL (B)
 Electrical System: 127/220 a.c., 50 Hz.
 Telephone Country Code: (62)
 Major City Telephone Codes:
 Jakarta - 21
 Bandung - 22
 Semarang - 24
 Surabaya - 31
 Medan - 61
 Yogyakarta - 274
 Malang - 341
 Ujung Pandang - 411
 Manado - 431
 Banjarmasin - 511
 Palembang - 711
 Padang - 751
 Jayapura - 967

Number of TV Sets: 13,000,000
 Number of TVRO Systems: 500,000

INTELSAT REPRESENTATIVE:

PT. INDOSAT

PT INDOSAT BLDG., 12 Floor
 Jakarta 10110
 Indonesia
 Mr. A. Rival, General Manager, Operations
 Tel: (62) 21-384-8107

PT. INDOSAT

Jalan Merdeka Barat 21
 Jakarta 10110
 Indonesia
 Mr. A. Rousstie, Manager, Network Operations
 Tel: (62) 21-370-102/353-605
 Fax: (62) 21-370-102

EARTH STATIONS:

JATILUHUR 1 - 177° E
 JATILUHUR 2 - 60° E
 JATILUHUR 3 - 174° E
 JATILUHUR 4 - 177° E

Asiasat EIRP/Coordinates:
 Medan: 31 dBW (3.5m TVRO)
 Elevation: 81; Azimuth: 115

Broadcast Organizations:

Rajawali Citra Televisi Indonesia (RCTI) ✓

Jalan Raya Perjuangan
 Kebon Jeruk
 Jakarta 11530
 Indonesia
 Tel: (62) 21-530-3540
 Fax: (62) 21-549-3846 ✓

Televisi Republik Indonesia (TVRI)

P.O. Box 3526
 Jakarta 10001
 Indonesia
 Tel: (62) 21-581-125

SATELLITE OPERATOR:

(Palapa Pacific) ✓

PT Pasifik Satelit Nusantara

Chase Plaza, 17th Floor
 Jalan Jendral Sudirman Kav. 21
 Jakarta 12910
 Indonesia
 Mr. Adi R. Adiwoso, Director
 R. Soeshaktihadi Magetsziri, Vice President
 Tel: (62) 21-520-8114
 Fax: (62) 21-570-6437

(Palapa B & C series satellites)

PT Telkom

PT Telekomunikas Indonesia
 Jalan Leetjen S. Parman Kav. B
 Jakarta 11440
 Indonesia
 Sahala Silalahi, Deputy Director for
 Satellite Operation
 Tel: (62) 21-566-6309
 Fax: (62) 21-566-6330

SATELLITE COMPANIES:**Adiwarna Electronics Co.** ✓

Glodok Plaza Blok F No. 49
 Jalan Pinangslaya Raya
 Jakarta 11110
 Indonesia
 Tel: (62) 21-659-6353
 Fax: (62) 21-600-0072

TVRO Distributor including DX (Japan) TVRO and
 SMATV product lines.

Hughes Network Systems Asia-Pacific ✓

Suite 1904, Gedung BRI 2
 Jalan Jenderal Sudirman KAV. 44-46
 Jakarta 10210
 Indonesia
 Michael J. Santos, Regional Director
 Dody Harminto, Sales Executive
 Tel: (62) 21-571-3551/3/5
 Fax: (62) 21-571-3554

Products manufactured: VSAT systems, satellite
 modems, mobile satellite equipment,
 videoconferencing systems, packet switching, frame
 relay, digital cellular equipment.

PT. Citra Sari Makmur

Chase Plaza 16th Floor
 Jalan Jend. Sudirman Kav. 21
 Jakarta 12910
 Indonesia
 Ralph E. Tozier, Managing Director
 Brata T. Hardjosubroto, General Mgr., Marketing
 Said Sungkar, Marketing Manager
 Tel: (62) 21-570-0193, -0194, 4362
 Fax: (62) 21-570-4656

VSAT Satellite Operator

PT Hartono Istana Teknologi

Jalan AIPDA K.S. Tubun IT/6
 Jakarta 11410
 Indonesia
 Vincent Hermawli, Director
 Antonius Iryawan, Marketing Officer
 Tel: (62) 21-548-6988, 530-1282
 Fax: (62) 21-530-3856, 530-2225, 548-0141

Products manufactured: satellite TVRO receiver;
 products distributed: satellite TVRO receiver.

PT. Karsani Cipitalistari

Jalan Pluit Karang Selatan No. 21
 (Sampling Toll Sukarno Hatta)
 Jakarta Utara
 Indonesia
 Mr. Petrus Ratulangi, Marketing Manager
 Tel: (66) 21-660-6156 (hunting)
 Fax: (66) 21-660-6155

Products distributed: accessories.

P.T. Kwintercom ✓

Jalan Gunung Sahari 96
 Jakarta, Pusat
 Indonesia
 Iwan Damar
 Fax: (62) 380-2030

TVRO distributor

P.T. Primatama Parabola ✓

Ruko Tomang Tol Blok A II
 No. 40, Jakarta 11520
 Indonesia
 Rudianto Gani

IRAN



INTELSAT REPRESENTATIVE:

Telecommunication Company of Iran (TCI)

P.O. Box 16315-159

Tehran, Iran

Mr. M.H. Harati, Director General

Satellite Communications Department

Tel: (98) 21-860-1041

Fax: (98) 21-858-566

EARTH STATIONS:

ISFAHAN 1 - 63° E

SHAID DR. GHANDI 3 - 359° E

SHAID DR. GHANDI 4 - 335.5° E

SHAID DR. GHANDI 5 - 60° E

TEHRAN 4 - 342° E

TEHRAN 5 - 342° E

In addition to the above-mentioned international earth stations, Iran also has seven domestic earth stations which interface using the INTELSAT satellite at 63 degrees East Longitude.

SATELLITE COMPANIES:

Computer & Communication Consult. Eng.

(C&C Consult Eng.)

P. O. Box 14155 - 4967

Tehran, Iran

Mr. K. Talebzadeh, Managing Director

Mr. S. Goodarzi, Head of the Board

Mr. A. Kolani, Telecom Manager

Tel: (021) 896-662

Fax: (021) 896-662

Products distributed: SMATV, TVRO, VSAT (STAR or MESH configuration), mobile satellite communications systems, videoconferencing systems, satellite modems; services provided: consulting, transponder brokerage, VSAT services (STAR or MESH configuration).

C & C Consult. Eng. provides a wide range of equipment including personal computers and related products, telecommunications and satellite communications equipment. The company also presents complete engineering services including consulting, system integration and engineering, installation, field support, maintenance and training.

Government:	Islamic Republic
Population:	63,380,000
Gross National Product:	US\$ 95 billion (Estimated 1993)
Language(s):	Farsi, Azerbaijani, Kurdish, English, French
Religion:	Muslim
Time Standard:	GMT+3.5
Currency Standard:	Rial (1.52 = US\$ 1)
Video Standard:	SECAM
Electrical System:	220 a.c., 50 Hz.
Telephone Country Code:	(98)
Major City Telephone Codes:	
Tehran - 21	
Isfahan - 31	
Tabriz - 41	
Mashad - 51	
Ahvaz - 61	
Shiraz - 71	
Rasht - 231	
Qom - 251	
Kerman - 341	
Yazd - 351	
Bakhtaran - 431	
Abadan - 631	
Bandar 'Abbas - 761	

IRAQ



Government: Republic
 Population: 21,080,000
 Gross National Product: US\$ 45 billion
 (Estimated 1993)
 Language(s): Arabic, Kurdish
 Religion: Muslim
 Time Standard: GMT+3
 Currency Standard: Dinar
 (0.31 = US\$ 1)
 Video Standard: SECAM
 Electrical System: 220/380 a.c., 50 Hz
 Telephone Country Code: (964)
 Major City Telephone Codes:
 Baghdad - 1
 Ar-Ramadi - 24
 Ba'qubah - 25
 Al-Hillah - 30
 Karbala - 32
 An-Najaf - 33
 Basra - 40
 An-Nasiriyah - 42
 Al-Amarah - 43
 Kirkuk - 50
 Mosul - 60

TV Households: 620,000

INTELSAT REPRESENTATIVE:

COMGEN BAGHDAD

Tel: (964) 718-1865

EARTH STATION:

DUJAIL 2 - 335.5° E (POSTPLAN)

SATELLITE COMPANY:

Al Tai Sat

P.O.Box 6100
 Mansor, Baghdad 12605 Iraq
 Saad Al Tai, General Manager
 Aqil Ajina, Head, Sales Department
 Tel: (964) 1-541-1277, 556-7711

Products distributed: complete TVRO systems and components (LNBS, feedhorns, receivers, and positioners), Inmarsat portable systems, GPS mobile systems, test equipment, and SMATV systems; services provided: technical consulting on satellite TV, SMATV, Inmarsat and GPS services.

ISRAEL



Government: Republic
 Population: 4,600,000
 Gross National Product: US\$ 49.5 billion
 (Estimated 1993)
 Language(s): Hebrew, Arabic,
 English, Russian
 Religion: Jewish, 13% Muslim
 minority
 Time Standard: GMT+2
 Currency Standard: Shekel
 (2.81 = US\$ 1)
 Video Standard: PAL
 Electrical System: 230/400 a.c., 50 Hz.

Telephone Country Code: (972)
Major City Telephone Codes:
Jerusalem, Hebron, Bethlehem -2
Tel Aviv, Holon, Petach-Tikva,
Ramat Gan, Bene Beraq - 3
Haifa - 4
Nablus - 53
Beersheba - 57
Elat - 59
Jericho - 292

INTELSAT REPRESENTATIVE:

Bezeq Israel Telecommunications Corporation Ltd.

Jerusalem
Israel
Mr. Nuriel Elyasi
Head of International Communications
Tel: (972) 2-395-363
Fax: (972) 2-259-415

EARTH STATIONS:

EMEQ HA'ELA 1 - 335.5° E
EMEQ HA'ELA 2 - 342° E
EMEQ HA'ELA 3 - 63° E
GAL ON 1 - 342° E
JERUSALEM (U.N.) 2 - 332.5° E
(UNITED NATIONS)

BROADCAST SERVICES:

Channel 2 Israel

3 Kanfey Nesharim St.
Jerusalem 94904
Israel

Israel Educational TV Channel 1

14 Klausner St. Ramat Aviv
Tel Aviv
Israel

Israeli TV

P.O.B. 7139
Jerusalem 91071
Israel
Tel: (972) 2-301-333
Fax: (972) 2-380-751

KOL Israel - Ext. Service

P.O.B. 1082
Jerusalem 91010
Israel

SATELLITE COMPANIES:

Elisra Ltd.

48 Mivtza Kadesh SE
Bene Beraq 51203
Israel
Dr. Shlomo Zach, Marketing & System Engineer

Products manufactured: Special VSAT Systems, satellite spacecraft communications systems, test equipment, LNBs, antennas, receivers, and complete terminals. Elisra has, over the years, cultivated an experienced and motivated staff of around 1,000 people. More than 80 percent of the employees are graduate engineers, software programmers and skilled technicians. Total sales of Elisra Electronic Systems for 1991 reached US\$ 113 million.

ELTA

P.O.B. 330,
Ashdod 77102
Israel
Tel: (972) 8-572-333
Fax: (972) 8-563-933

Prime Contractor for the Amos domestic satellite system.

IAI/MBT Systems and Space Technology

P.O.B. 105, Yahud 56000
Israel
Tel: (972) 3-531-5555
Fax: (972) 3-536-5323

Developer of the Amos domestic satellite system.

Israel Space Agency (ISA)

c/o Ministry of Science and Technology
26a Chaim Levanon St.
Ramat Aviv, Tel-Aviv
P.O. B. 17185, Tel-Aviv 61171
Israel
Tel: (972) 3-642-2297
Fax: (972) 3-642-2298

AMS satellite spacecraft manufacturer

Jersulaem Capitol Studios Ltd.

206 Jaffa Rd.

P.O.B. 13172

Jerusalem, 91131

Israel

Gabriel Rosenburg, Mng. Dir. & CEO

Samuel Shiloh, Mng. Dir.

Benzi Bar-zu, Deputy Mng. Dir., Eng.

Ari Armoza, Deputy Mng. Dir., Productions

Tel: (972) 2-701711

Fax: (972) 2-381658

Services provided: Uplink services, TV services, editing, post-production, satellite and microwave links, studios, graphics and animation.

Tamam

P.O.B. 75

Yahud 56100

Israel

Tel: (972) 3-531-5003

Fax: (972) 3-536-4687

Involved in the conceptual and developmental stages of the Amos domestic satellite system.

Tadiran

26 Hashoftim St.

P.O.B. 267

Holon 58102

Israel

Tel: (972) 3-557-4555

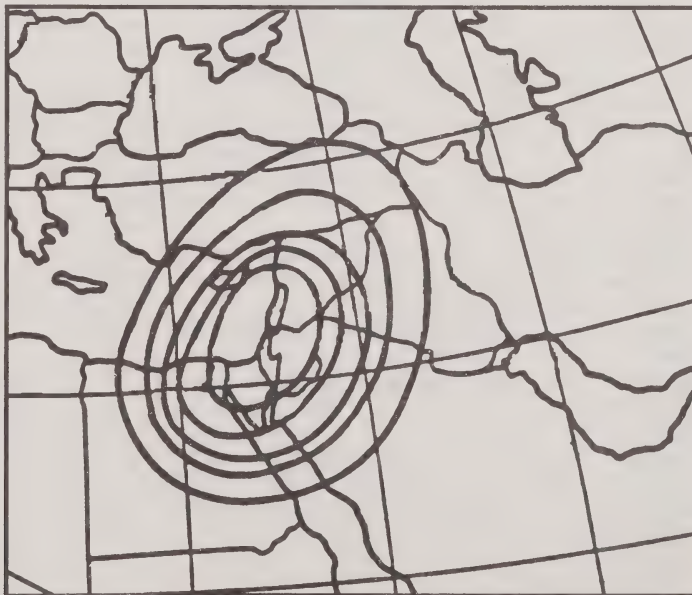
Fax: (972) 3-557-4776

Developer and manufacturer of communications systems and equipment from 2 MHz through 18 GHz. Also produced the TT&C space and ground segment for the Israeli Space Program.

The AMOS Domestic Satellite System

IAI/MBT is the prime contractor for Israel's AMOS geostationary domestic communications satellite system for Israel. The complete system will consist of two light-weight (450kg) AMOS satellites collocated at 15 degrees East Longitude, which together will provide a total of twelve transponders, mainly in the Ku-band, each with a bandwidth of 72 MHz.

The AMOS system will be used for domestic telephone, telex, telefax and television for both private and governmental networks. Three or four TV channels will be provided, one or two of which will be capable of Direct Broadcast Services to satellite receiving antennas of less than 1 meter in diameter. IAI/MBT is the prime contractor for the Amos system, the first of which is scheduled to be launched by Arianespace in 1994.



AMOS Ku-Band beam coverage
from 15 degrees East Longitude

JAPAN



Government: Constitutional Monarchy
 Population: 125,010,000
 Gross National Product: US\$ 3.65 Trillion (1993 estimated)
 Language(s): Japanese
 Religion: Buddhism, Shintoism
 Currency: YEN (103 = 1 US\$)
 Time Standard: +9 GMT
 Video Standard: NTSC
 Electrical System: 100 A.C. 50/60 Hz.
 Telephone Country Code: (81)
 Major City Telephone Codes:
 Tokyo - 3
 Osaka - 6
 Sapporo - 11
 Sendai - 22
 Niigata - 25
 Kawasaki - 44
 Yokohama - 45
 Nagoya - 52
 Kyoto - 75
 Kobe - 78
 Hiroshima - 82

Fukuoka - 92
 Kitakyushu - 93
 Nagasaki - 958
 Kagoshima - 992

Number of TV Sets: 76,000,000
 Number of Cable Subs: 8,344,188
 (March, 1993)

Number of Satellite TV Subscribers:

NHK BS Service - 5,020,000 (As of March, 1993)
 Wowow BS Service - 1,260,000
 Satellite Digital Audio Broadcasting (SDAB) - 40,000
 JCSat - 12,597 (September, 1993)
 Superbird CS - 22,946 (September, 1993)

INTELSAT & INMARSAT SIGNATORY:

Kokusai Denshin Denwa Co. Ltd. (KDD)

2-3-2 Nishi-Shinjuku, Shinjuku-ku
 Tokyo 163 Japan

MAIN Tel: (81) 3-3347-6600
 MAIN Fax: (81) 3-3347-6587
 TV Admin: (81) 3-3275-4450/4451

Shizuo Endo, Director, Transmit Systems
 Naohiko Hattori, Director, Trans. Sys. Dept.
 Yasuo Hirata, Director, Business Devt. Hdqtrs.
 Tel: (81) 3-3347-7431
 (81) 3-3347-6899
 Fax: (81) 3-3347-7199
 (81) 3-3347-6306

Mr. Masaru Motoyuki
 Manager, Business Communications
 Engineering Division

Tel: (81) 3-3347-7010
 Fax: (81) 3-3347-7142
 Fax: (81) 3-3275-4589

STATIONS: IBARAKI 4 - 174° E
 IBARAKI 5 - 177° E
 IBARAKI 6 - 183° E
 IBARAKI 7 - 177° E
 IWAKUNI TVRO - 177° E
 MISAWA TVRO - 177° E
 OKINAWA - 177° E
 OSAKA TELEPORT - 174° E
 SASEBO TVRO - 177° E
 TOKYO 2 - 174° E
 TOKYO 3 TVRO - 180° E
 TOKYO 4 TVRO - 180° E
 TOKYO 5 TVRO - 180° E

TOKYO 6 TVRO - 180° E
 TOKYO 7 TVRO - 183° E
 YAMAGUCHI 2 - 60° E
 YAMAGUCHI 3 - 63° E
 YAMAGUCHI 5 TVRO - 177° E

C- & Ku-band Transportables &
 1 Ku-band Fly Away

SECOND INTELSAT OPS. REPRESENTATIVE:

International Digital Communications (IDC)

Tel: (81) 3-5820-5165

Fax: (81) 3-5820-5381

STATIONS: IDC CHIBA 1 - 174° E
 IDC CHIBA 2 - 183° E
 IDC YAMAGUCHI 1 - 63° E
 IDC YAMAGUCHI 2 - 60° E

THIRD INTELSAT OPS. REPRESENTATIVE:

International Telecom Japan (ITJ)

Tel: (81) 3-5565-0040

Fax: (81) 3-5565-0044/0006

STATIONS: ITJ CHIBA 1 - 177° E
 ITJ CHIBA 2 - 174° E
 KAMIYAMAGUCHI ITJ 1 - 63° E
 KAMIYAMAGUCHI ITJ 2 - 60° E

**PRIVATE INTERNATIONAL
 SATELLITE OPERATOR:**

TRW Overseas Inc.

Maekawa-Kudan Bldg.

2-3-7, Kudankita 2-chome

Chiyoda-ku, 102 Tokyo Japan

Mr. Nobuyuki Arino, Mng. Dir.

Space Systems

Tel: (81) 3-3234-8891

Fax: (81) 3-3234-9036

International satellite transmission services
 on two TRW-built TDRS satellites

Telecommunications Satellite Operator:

Nippon Telegraph & Telephone Corp. (NTT)

Shin-kasumigaeski, Bldg. 18F

3-3-2, Kasumigaseki, Chiyoda-ku

Tokyo 100 Japan

Masahide Kajiyama

Tel: (81) 3-3509-5730

Fax: (81) 3-3503-4947

SATELLITE EDUCATIONAL ORGANIZATIONS:

**International Satellite Communications
 Society**

2-3-2, Nishishinjuku, Shinjuku-ku

Tokyo 162 Japan

Ken-ichi Miya, President

Hideo Nagata, Executive Managing Dir.

Tel: (81) 3-3347-5161

Fax: (81) 3-3347-5165

DOMESTIC SATELLITE OPERATORS:

Japan Satellite Systems Co. Ltd. (JSSC)

Shiroyama JT Mori Building, 27F

4-3-1 Toranomon Minato-ku

Tokyo 105 Japan

Tel: (81) 3-5400-3701

Fax: (81) 3-5472-7647

Space Communications Corporation

2-2, Uchisaiwaicho 2-chome

Chiyoda-ku

Tokyo 100 Japan

Kazunobu Iijima, Director, Gen. Mgr.

Marketing & Sales Division

Tel: (81) 3-3503-3184/3191

Fax: (81) 3-3503-3197

Asiasat EIRP/Coordinates:

Tokyo: 30 dBW (3.7m TVRO)

Elevation: 35; Azimuth: 229

NATIONAL SATELLITE LAUNCH AGENCY:

**National Space Development Agency of
 Japan (NASDA)**

2-4-1 Hamamatsu-cho

Minato-ku

Tokyo 105 Japan

Tel: (81) 3-3435-6177

Fax: (81) 3-3433-0796

BROADCAST ORGANIZATIONS:

Asahi National Broadcasting Co.

1-1-1 Roppongi

Minato-ku

Tokyo 106 Japan

Tel: (81) 3-3587-5412

Fax: (81) 3-3505-3539

Fuji Television Network

3-1 Kawada-cho
Shinjuku-ku
Tokyo 162 Japan
Tel: (81) 3-3353-1111
Fax: (81) 3-3358-8038

Nippon Hoso Kyoki (NHK)

Hoso Center
2-2-1 Jinnan, Shibuya-ku
Tokyo 150-01 Japan
Mr. Shunichi Itaya, Editor in Chief
Toyoaki Hasegawa, Director General,
Planning Bureau
Yoshiro Nakamura, Exec. Vice President
Hajime Senno, Mgr., Satellite Operations
Tel: (81) 3-5478-2300
Fax: (81) 3-3465-0952
(81) 3-3478-1603

Nippon Television Network (NTV)

14 Niban-cho
Chiyoda-ku
Tokyo 102-40
Tel: (81) 3-3265-2111
(81) 3-5275-1111
Fax: (81) 3-3263-6008
(81) 3-5275-4008

Tokyo Broadcasting System, Inc.

5-3-6 Akasaka
Minato-ku
Tokyo 107-06
Tel: (81) 3-3584-3111
Fax: (81) 3-3588-6378

TV Tokyo Channel 12

4-3-12 Toranomon
Minato-ku
Tokyo Japan
Tel: (81) 3-3432-1212
Fax: (81) 3-5473-3455

VISNEWS/Reuters TV

Asia-Pacific Region
Aoki Bldg., 6F 4-1-10 Toranomon,
Minato-ku
Tokyo 105 Japan
John Tucker, Business Manager
Tel: (81) 3-3433-1098
Fax: (81) 3-3433-2921

World Television News (WTN)

Tsukiji Hamarikyu Bldg.
5-3-3 Tsukiji
Chuo-ku 104 Tokyo
Japan
Tel: (81) 33-3545-3977
Fax: (81) 33-3545-3964

SATELLITE/CABLE TV CHANNELS:

Asahi New Channel

5-3-2 Tsukiji
Chuo-ku
Tokyo 104 Japan
Tel: (81) 3-5550-6030
Fax: (81) 3-5550-6030

Cable Soft Network

Masumoto Bldg 7 Fl
1-21 Agebacho
Shinjuku-ku
Tokyo 162 Japan
Tel: (81) 3-3288-5901
Fax: (81) 3-3268-5904

Channel Neco

2-16-2 Higashi Azaku
Minato-ku
Tokyo 106 Japan
Tel: (81) 3-3505-2413
Fax: (81) 3-3505-0881

Children's Channel

Yamada Bldg. 12 fl
Nakano-ku
3-30-12 Nakano
Tokyo 164 Japan
Tel: (81) 3-3380-1451
Fax: (81) 3-3380-4601

Eisei Eiga Engeki/Hoso

Togeki Bldg. 5H
4-1-1 Tsukiji
Chuo-ku
Tokyo 104 Japan
Tel: (81) 3-5250-2321
Fax: (81) 3-5250-2324

HDTV Hi Vision Promotion Association

1-9-6 Sendagaya
Shibuya-ku
Tokyo 151 Japan
Tel: (81) 3-3746 1126
Fax: (81) 3-3746-1138

Japan Leisure Channel

Sasagawa Kinenkaikan 6H
3-12-12 Mita
Minato-ku
Tokyo 108 Japan
Tel: (81) 3-5443-2713
Fax: (81) 3-5443-2714

Japan Sports Channel

Stage Jingumae No. 2 Bldg., 5H
2-12-2 Jingumae Shibuya-ku
Tokyo 150 Japan
Tel: (81) 3-3497-9903
Fax: (81) 3-3497-9909

JCTV - Japan Cable Television

5-2-23 Roppongi
Minato-ku
Tokyo 106 Japan
Tel: (81) 3-3405-3191
Fax: (81) 3-3423-6919

Kids Station

Neo Satellite vision
2-14-1 Ginza
Chuo-ku
Tokyo 104 Japan
Tel: (81) 3-3545-3207
Fax: (81) 3-3545-3292

Life Design Channel

Nihon Eizo Network
3-22 Kanda Nishiki-cho
Chiyoda-ku
Tokyo 101 Japan
Tel: (81) 3-3233-6455
Fax: (81) 3-3233-6456

Music Bird

Ferute Kojimachi
1-7 Kojimachi
Chiyoda-ku
Tokyo 102 Japan
Tel: (81) 3-3261-8180
Fax: (81) 3-261-8975

Music Channel

Tango 33 Bldg.
3-25-11 Higashi
Shibuya-ku
Tokyo 153 Japan
Tel: (81) 3-5466-1103
Fax: (81) 3-5466-1108

Nihon TV Cable News

14 Nibancho,
Chiyoda-ku
Tokyo 102-40 Japan
Tel: (81) 3-5275-1111
Fax: (81) 3-5275-4020

Nikkei Satellite News

c/o Nihon Keizai Shimbun
1-9-5 Otemachi, Chiyoda-ku
Tokyo 100-66 Japan
Ryozo Fujita, Manager, Telecom Dept.
Tel: (81) 3-5294-2450
Fax: (81) 3-5294-2459

Satellite ABC

2-2-48 Oyodo-minami
Kita-ku
Osaka 531 Japan
Tel: (81) 6-452-1161
Fax: (81) 6-452-1222

Satellite Culture Japan

Nikken Gakuin Bldg.
1-21-16 Higashi-ikebukuro
Toshima-ku
Tokyo 170 Japan
Tel: (81) 3-5992-5041
Fax: (81) 3-5992-5049

Space Shower TV

3-10-9 Aobadai
Meguro-ku
Tokyo 153 Japan
Tel: (81) 3-3770-5721
Fax: (81) 3-3770-5745

Space Vision Network

Mainichi Kaikan Kitakan
1-6-16 Dojima
Osaka 530 Japan
Tel: (81) 6-341-5146
Fax: (81) 6-341-5148

Star Channel, Inc.

4-17-7 Akasaka
Minato-ku
Tokyo 107 Japan
Tel: (81) 3-5563-0438
Fax: (81) 3-5563-0440

Super Channel

Akabishi Bldg. 3F
4-1-29 Akasaka
Minato-ku
Tokyo 107 Japan
Tel: (81) 3-5563-0433
Fax: (81) 3-5563-0437

Wowow World Entertainment

(Japan Satellite Broadcasting Inc.)
1-19-10 Toramon
Minato-ku
Tokyo 105 Japan
Tel: (81) 3-3596-8331
Fax: (81) 3-3501-5014

REGULATORY ORGANIZATION:

Ministry of Posts & Telecommunications

3-2 Kasumigaseki, 1-Chome
Chiyoda-ku
Tokyo 100 Japan
Tel: (81) 3-3504-4411
Fax: (81) 3-3503-0648

INTERNATIONAL LAUNCH PROVIDER:

Arianespace

Hibiya Central Building, 10F
1-2-9 Nishi-Shimbashi
Minato-ku
Tokyo 105 Japan
Dr. Jean-Louis Claudon, Asia/Pacific
Representative
Dieter Brand, Deputy Representative
Tel: (81) 3-3592-2766
Fax: (81) 3-3592-2768

SATELLITE MANUFACTURING & SERVICE:

Anritsu Corporation

5-10-27
Minami-Azabu
Minato-ku
Tokyo 106 Japan
Tel: (81) 3-3446-1111
Fax: (81) 3-3440-2430

Manufacturer of Inmarsat terminals

BIT Corporation

Ouro Verde 6F
49-9, Denenchofu-honcho, Ohta-ku
Tokyo 145 Japan
Takashi Takemoto, President
Tel: (81) 3-3722-3461
Fax: (81) 3-3722-3016

CBC Systems Corporation

12-16 Nihonbashi-Tomisawacho
Chuo-ku, Tokyo 103 Japan
Tel: (81) 3-3669-6931
Fax: (81) 3-3669-9762

CRC System Corporation

7-6, Odenma-cho, Nihonbashi
Chuo-ku, Tokyo 103 Japan
Michio Ono, President
Tel: (81) 3-3665-9898
Fax: (81) 3-3665-9961

Furuno Electric Company Ltd.

9-52 Ashihara-cho
Nishinomiya 662 Japan
Tel: (81) 798-65-2111
Fax: (81) 798-65-4200

Manufacturer of Inmarsat terminals

Fujitsu Ltd.

3-13-3, Nishi-shinbashi, Minato-ku
Tokyo 105 Japan
Yoshio Watanabe, Manager, Sat. Comm.
Tel: (81) 3-5470-7634
Fax: (81) 3-5470-7642

IDO Corporation

Gobancho YS Bldg., 12-3 Gobancho
Chiyoda-ku Tokyo 102 Japan
Toshio Satoh, Technical Advisor
Tel: (81) 3-3263-9977
Fax: (81) 3-3263-9987

Ikegami Tsushinki Company, Ltd.

1-11-1, Motoki, Kawasaki-ku
Kawasaki, Kanagawa, 210 Japan
Yutaka Imahori
Tel: (81) 4-4211-7313

Japan Business Television Inc.

3-3-13 Kitaaooyama, Minato-Ku
Tokyo, 107 Japan
Tel: (81) 3-470-3080
Fax: (81) 3-470-7593

Japan Radio Co. Ltd (JRC)

Akasaka Twin Towers (Main), 17-22
 Akasaka 2-chome
 Minato-ku, Tokyo 107 Japan
 Tel: (81) 3-3584-8744
 Fax: (81) 3-3584-8891

Manufacturer of Inmarsat terminals and phase-locked LNBs

Japan Satellite Comm. Network Corp.

Kakimi Bldg., 3-2, Kojimachi
 Chiyoda-ku, Tokyo 102 Japan
 Kenichi Tsunoda, Director &
 Chief Tech. Officer
 Tel: (81) 3-3221-7511
 Fax: (81) 3-3221-7510

Koden Electronics Co. Ltd.

Tel: (81) 3-3440-3864
 Fax: (81) 3-3473-3837

Manufacturer of Inmarsat terminals

Kokusai Telecommunications

2-4-1, Nishi-Shinjuku, Shinjuku-ku
 Tokyo 163 Japan
 Yasuhiko Kawasumi, Managing Director
 Tel: (81) 3-3794-8272
 Fax: (81) 3-3794-8293

M.C.C. Corporation

6-2-31, Roppongi, Minato-ku
 Tokyo 106 Japan
 Shojiro Nakahara, Executive Vice President
 Tel: (81) 3-3405-2650
 Fax: (81) 3-3401-1064

Marubeni Corporation

1-4-2 Ohtemachi, Chiyoda-ku 1-Chome
 Tokyo 100 Japan
 Yuji Niwa, General Mgr, Satellite Business
 Tel: (81) 3-3282-2364
 Fax: (81) 3-3282-4264

Matsushita Electric Industrial Co. Ltd.

1-1, Matshushita-cho, Ibarki,
 Osaka 567 Japan
 Mitsuo Shoji, Manager, Marketing & Sales
 Tel: (81) 726-24-7817
 Fax: (81) 726-23-4845

Manufacturer of satellite components

Mitsubishi Electric Corporation

2-6-3 Marunouchi
 Chiyoda-ku
 Tokyo 100 Japan
 Hironori Aihara, General Manager
 Takashi Ikemoto,
 General Manager, Space Programs
 Tel: (81) 3-3210-4608
 (81) 3-3218-3330
 Fax: (81) 3-3210-4590
 (81) 3-3218-3314

Mitsubishi Electric Corporation

8-1-1, Tsukagoshi-honmachi
 Amagasaki, Hyogo 661 Japan
 Katsuhiko Aoki, Deputy Manager
 Tel: (81) 6-497-6080
 Fax: (81) 6-497-6310

Manufacturer of satellite spacecraft components and systems

Mitsui & Company Ltd

2-1 Ohtemachi 1-Chome
 Chiyoda-ku
 Tokyo 100 Japan
 Kiyoshi Tsuda, General Mgr.,
 Satellite Project Dept.
 Yasumasa Tsuruno, Chief Engineer,
 Satellite Project Department
 Tel: (81) 3-3285-7335
 (81) 3-3285-7925
 Fax: (81) 3-3285-9925

Manufacturer of satellite spacecraft components and systems

NEC Corporation

4035, Ikebe-cho, Midori-ku
 Yokohama-shi, Kanagawa-ken
 226 Japan
 Kotaro Katoh, General Mgr.
 Hiromi Hayashi, Vice President
 Susumu Kitazume, Vice President
 Takaji Kuroda, Corporate Chief Engineer
 Ikuo Hosoda, Engineering Mgr., Satellite
 Tel: (81) 45-939-2200
 (81) 45-939-2008
 (81) 45-939-2006
 (81) 45-939-2005
 Fax: (81) 45-939-2209
 (81) 45-939-2179
 (81) 45-939-2408
 (81) 45-934-3587

NEC Corporation

3-3-1, Shiba, 5-chome, Minato-ku
Tokyo 108-01 Japan
Tadahiro Sekimoto, President
Tel: (81) 3-454-1111
Fax: (81) 3-798-6541

Manufacturer of large earth stations, TVRO and Inmarsat equipment.

NEC System Integration & Construction Ltd.

3-9-4, Nishi-shinbashi, Minato-ku
Tokyo 105 Japan
Tel: (81) 3-3436-3111
Fax: (81) 3-3438-9659

NHK Integrated Technology Inc.

4-14 Kamiyama-cho, Shibuya-ku
Tokyo, 150 Japan
Mr. Naohiko Shimada, Mng. Dir., Int. Dept
Mr. Jiro Ohno, Deputy, Mng. Dir.
Mr. Masao Migita, Mgr. Bus. Div.
Mr. Hideto Yuu, Mgr., Eng. Div.
Hideo Sato, Mgr., Business Div., Int. Dept.
Tel: (81) 3-3481-7631
Fax: (81) 3-3481-7617

Engineering services for radio and television broadcasting including satellite business.

NHK Integrated Technology Inc. (NHK ITEC) is an affiliated company of NHK (Nippon Hoso Kyokai), or Japan Broadcasting Corporation, established in 1969. NHK ITEC has been conducting engineering services including site surveys, systems design, construction and post-construction maintenance for radio and television facilities. NHK ITEC has also been extending its services overseas and since its foundation has completed about fifty projects for broadcasting facilities in developing countries.

Nichimen Corporation

11-1, Nihonbashi 3-chome
Chuo-Ku, Tokyo 103 Japan
Takumi Nambu, Electronics Section
Tel: (81) 3-3277-5962
Fax: (81) 3-3277-5870

Products manufactured: commercial grade LNBs, both C & Ku-band, which include MMIC, PLL, high stabilized, digital and VSAT ready. Also available: ODU's in C & Ku-bands with various power ratings. and tuners in digital analog and SCPC versions, using both the European and U.S. frequency bands;

products distributed: same as above.

**Nippon Hoso Kyoki (NHK)
Science & Technology**

1-10-11, Kinuta, Setagaya
Tokyo 157 Japan
Takehiro Izumi, Director General,
Science & Technology
Taro Komoto, Senior Exec. Research Eng.
Tel: (81) 3-5494-2200
(81) 3-5494-2212
Fax: (81) 3-5494-2420
(81) 3-5494-2418

Broadcasting Research

Nikkei Advanced Systems, Inc.

NAS Center-Nikkei Minamisuna Annex
5-8-1, Minamisuna Koto-ku
Tokyo 136 Japan
Akira Kawaguchi, Director
Tel: (81) 3-5690-1505
Fax: (81) 3-5690-1518

Nissho Iwai Corporation

2-4-5, Akasaka, Minato-ku
Tokyo 107 Japan
Naoyoshi Abe, General Manager
Tel: (81) 3-3588-2898
Fax: (81) 3-3588-4693

Nomura Research Institute, Ltd.

134, Godo-cho, Hodogaya-ku
Yokohama, Kanagawa 240 Japan
Takeshi Shinohara, General Mgr.,
Advanced Systems Dept.
Tel: (81) 45-336-8445
Fax: (81) 45-336-1443

**NTT Radio Communications
Systems Laboratories**

1-2356, Take, Yokosuka-shi
Kanagawa, 238-03 Japan
Kenji Kohiyama, Associate Vice President,
Executive Director
Tel: (81) 468-59-3300
(81) 468-55-1173

Osaka Media Port Corp.

2-27 Nakanoshima 6-chome
Kita-ku, Osaka 530 Japan
Tokiaki Ninomiya, Chairman
Sadao Odoi, President/CEO
Takeshi Ishida, Exec. V.P.

Tsuyoshi Ochi, Gen. Mgr, Bus. Devt.
 Tel: (81) 6-444-8487
 Fax: (81) 6-444-8489

Lease of antenna site at Osaka Teleport

**Remote Sensing Technology
 Ctr. of Japan**

Uni-Roppongi Bldg., 7-15-17
 Roppongi, Minato-ku
 Tokyo 106, Japan
 Tel: (81) 3-3403-1761
 Fax: (81) 3-3403-1766

Manufacturer of satellite components

Skynet Communications Inc.

4-5-37 Kamiosaki
 Shinagawa-ku
 Tokyo 141 Japan
 Tel: (81) 3-3494-7681
 Fax: (81) 3-3494-7915

Sumitomo Corporation

1-2-2, Hitotsubashi, Chiyoda-ku
 Tokyo 100 Japan
 Iwao Nakamura, Satellite Dept.
 Tel: (81) 3-3217-7028
 Fax: (81) 3-3217-7018

Supernet Inc.

2-6-3 Marunouchi
 Chiyoda-ku
 Tokyo 100-86 Japan
 Shunichiro Kawabata, Managing Director
 Tel: (81) 3-3210-8887
 Fax: (81) 3-3210-8885

Telecommunications Satellite

Banzai Building, 6F
 2-31-19, Shiba, Minato-ku
 Tokyo 105 Japan
 Misao Matsushita, Managing Director
 Tel: (81) 3-3769-6811
 Fax: (81) 3-3452-7600

Toyocom Japan

International Operations Division
 Onarimon Daiichi Bldg.
 20-4 Nishi-Shimbashi 3-chome
 Tokyo 105 Japan
 Tel: (81) 3-3459-7320
 Fax: (81) 3-3436-1434

Manufacturer of Inmarsat terminals and TVRO receivers

Videocom International Corp.

Landic Akasaka bldg.
 2-3-4 Akasaka
 Minato-ku
 Tokyo 107 Japan
 Tel: (81) 3-3505-5540
 Fax: (81) 3-3505-5549

Videosat Communications Inc.

2-5-1, Kita-Aoyama
 2 Chome Minato-Ku
 Tokyo 107-77 Japan
 Hideaki Kido, Group Manager
 Koya Mita, Senior Mng. Director
 Tel: (81) 3-3497-3226
 (81) 3-3497-3000
 Fax: (81) 3-3497-3177
 (81) 3-3497-2256

Yagi Antenna

1-6-10 Uchikanda
 Chiyoda-ku, Tokyo 101 Japan
 Tel: (81) 3-3292-7524
 Fax: (81) 3-3292-7625

TVRO MANUFACTURERS/DISTRIBUTORS:

DX Trading Co., Ltd.

7th floor, DX Building East Annex
 2-15 Hamazaki-Dori
 Hyogo-ku
 Kobe 652 Japan
 Sadao Kurisawa, General Manager
 Tel: (81) 78-652-0613
 Fax: (81) 78-652-0683

Products manufactured and distributed: LNBs, satellite receivers, TV modulators, FM modulators, channel processors, stereo processors, FM converters, stereo modulators, active combiners, passive combiners, and accessories.

Hitachi, Ltd.

216, Totsuka, Totsuka-ku
 Yokohama-shi, Kanagawa
 224 Japan
 Takenori Kawafune
 Tel: (81) 45-865-7045
 Fax: (81) 45-864-5007

Maspro Denkoh Corporation

Asada, Nisshin
Aichi-gun 470-01 Japan
Tel: (81) 52-802-2211
Fax: (81) 52-802-2200

Matsushita Electric Works

2-15, Matsuba-cho
Kadoma City
Osaka 571 Japan
Tel: (81) 6-901-1161
Fax: (81) 6-908-5969

Nippon Antenna Co. Ltd.

7-49-8 Nishi-Ogu
Arakawa-ku
Tokyo 116 Japan
Tel: (81) 3-3893-5221
Fax: (81) 3-3880-1931

Palcom Electronics Corporation

157-2 Iida-cho
Hamamatsu-city
Shizuoka 435 Japan
Tel: (81) 53-465-7231
Fax: (81) 53-465-5043

Toshiba Corporation

1-1-1, Shibaura 1-Chome
Minato-ku, Tokyo 105 Japan
Shiro Matsuo, Senior Vice President, Elect.
Tel: (81) 3-5484-5957
(81) 3-3457-3030
Fax: (81) 3-5484-6863
(81) 3-3457-0545

Ward

Century Building.,
325-1 Nakashinkai
Higashiosaka City 578 Japan
M. Shimamoto
Tel: (81) 729-65-0606
Fax: (81) 729-63-0220

Strong Far East

PO Box 85, Yokohama
Kanagaw-Ken 231 Japan
Tel: ((81) 45-681-5841
Fax: (81) 45-651-1842

Japan's Domestic & Regional Communications Satellites

BS-3A & -3B

On August 28, 1990, the Japanese BS-3A satellite was launched by a NASDA H-1 rocket from the Japanese Tanegashima Space Complex in Japan. When the satellite deployed its solar panels on August 31, 1990, Japanese engineers discovered that the power output level of the solar array was 25 percent lower than expected.

The loss of 25 percent of the solar array's power capability did not have an immediate effect on the operation of the spacecraft. The array had been designed to generate about 20 percent more power than the satellite would need at the beginning of life. However, the power output of the array will gradually decline over the lifetime of the spacecraft.

BS-3A provides capacity for NHK—Japan's national broadcasting company—to transmit two channels of television called DBS-1 and DBS-2. The satellite also is used to transmit a multi-channel digital audio service. As of March, 1993, more than five million Japanese homes were receiving NHK TV programming directly from BS-3A. Moreover, 40,000 Japanese homes were receiving digital audio broadcasts from the satellite.

On August 26, 1991, NASDA launched Japan's BS-3B direct broadcast satellite from facilities at the Tanegashima launch complex. The successful launch of the BS-3B satellite, which is worth US\$ 87 million, provided additional capacity that allowed NHK to begin offering a dedicated High Definition Television (HDTV) service. The satellite also supports a direct-to-home service called Wowow developed by Japan Satellite Broadcasting Co. As of March, 1993, 1,260,000 Japanese homes were receiving Wowow from the BS-3B satellite.

In September of 1992, NHK awarded GE Astro - Space (now Martin Marietta Astro - Space) a contract for the construction of a back-up satellite for the BS-3A and BS-3B satellites. The new satellite, called BS-3N, is similar in design to its forerunners, and will cost approximately the same as BS-3B. BS-3N currently is scheduled for an April, 1994, Ariane launch. The three-axis stabilized, three-channel direct broadcast satellite will have a liftoff mass of 1200 kg (2650 lb).

NHK Satellite TV Programming

NHK TV programming is uplinked via an eight-meter earth station located on the roof of the NHK Broadcast Center in Tokyo. In the event of a natural disaster or other emergency, NHK possesses a back-up earth station in Osaka and transportable earth stations that also could uplink signals to the satellites.

Satellite Channel 1 (DBS-1). All programs presented on Satellite Channel 1, which primarily covers world news and sports events, are exclusively for NHK's satellite service. In the world news time slot, news programs produced by major broadcasting stations in several countries are presented with minimum time differential. NHK also broadcasts news summaries during prime time viewing hours each evening along with economic programs reporting on the state of the global economy. Many sports events also are presented in prime time each evening, including U.S. Major League baseball games, Pro-football games, the World Cup football championship, Pro-boxing matches, skiing events, and auto-race championships.

Satellite Channel 2 (DBS-2). NHK's DBS-2 offers programming already offered by the terrestrial NHK TV service along with material exclusively for satellite TV viewers—about 40 percent of the total program con-

tent. Satellite Channel 2 presents a variety of programs from overseas, including movies, documentaries, dramas, animation, musical events, and children's programming.

The HDTV Channel. NHK also provides a High Definition Television (HDTV) service which uses the Hi-Vision HDTV system developed by NHK Laboratories. Experimental transmissions also are carried on this channel, including multi-channel, pulse code modulation (PCM), sound broadcasting and facsimile transmissions.

Digital Audio Broadcasting Service. Digital Audio Broadcasting (DAB) subscribers receive a wide variety of music styles with compact disc quality sound. Subscription to the service requires an initial deposit and a monthly fee.

Nintendo plans to use DAB capacity on the satellite to beam computer games direct to individual homes, thus making it more feasible for subscribers to play opponents in real time, participate in other interactive games, and access a central library of games via satellite and telephone line connections.

BSAT-1A & BSAT 1-B Satellites

In 1993, NHK, Japan Satellite Broadcasting, Inc., five other Tokyo-based broadcasters and eight banks joined in a consortium called the Broadcast Satellite Service. The new consortium intends to purchase two BSAT direct broadcast satellites from Hughes Aircraft Company. Scheduled for launch in July of 1997, BSAT-1A will replace BS-3A, while BSAT-1B will replace BS-3B in July of 1998. According to sources in Japan, the Ku-band BSAT-1 series satellites will have a wider coverage beam than existing spacecraft, covering other East Asian countries, including Korea, China, Taiwan, and Hong Kong.

Through the next generation of BSAT satellites, it will become possible for Japa-

nese broadcasters to begin using all eight DBS channels allocated to Japan by WARC 77. A new form of broadcasting known as ISDB (Integrated Services Digital Broadcasting) also may be offered. ISDB is a transmission medium in which various media, including pictures, sound, facsimile, and computer software are digitized and integrated into one satellite TV channel. Possible ISDB services ISDB may include a multi-channel PCM audio broadcasting system, a "data broadcasting" and an "audio graphics" capability that combines Hi-Vision still pictures and compact disc quality music.

CS-3A & -3B

On February 19, 1988, the dual-band CS-3A satellite was launched into space from NASDA's Tanegashima Space Center. Sister satellite CS-3B was launched on September 16, 1988. Both satellites were built by Mitsubishi Electric Corporation. The two CS-3 spacecraft were the world's first communications satellites to use Gallium-Arsenide (GaAs) solar cells that generate 150 percent of the amount of electricity produced by conventional silicon wafers.

Each CS-3 satellite provides one C-band and ten Ka-band transponders, for a combined capacity of more than 6,000 voice channels. The satellites' C-band footprints cover all of Japan including the remote islands. Ka-band coverage is restricted to the main Japanese islands.

CS-3A and CS-3B serve as emergency back-up links to the Japanese terrestrial telecommunications system in the event of a natural disaster or other emergency. The satellites also supply direct dialing access to the main islands' public telephone network from the remote Ogasawara Islands, where conventional undersea cables or terrestrial microwave facilities do not exist.

The CS-3 satellite system also handles

excess traffic between major regional centers whenever the existing terrestrial telephone system is overloaded by peaks in demand. All Ka-band transmissions use a TDMA system sending BPSK at a rate of 65 Mb/s. C-band transmissions use a TDMA system with QPSK at a rate of 100 Mb/s. The Nippon Telegraph and Telephone Corporation (NTT) is a major user of the CS-3 satellite capacity. The satellites also support various Japanese satellite digital communications services.

N-STAR A & B

In 1992, New York-based Loral Corp. was selected by Nippon Telegraph & Telephone Corp. (NTT), to build its US\$ 600 million "N-STAR" satellite system. Japanese company Mitsubishi will be a subcontractor for Loral, providing assistance in the manufacture of the two-satellite system. The satellites will feature functions such as disaster relief, mobile phone services, and communications throughout Japan. The satellites are expected to be launched in 1995, and will have a mission lifetime of ten years.

N-Star A and N-Star B, which will replace NTT's existing CS-3A and CS-3B satellites, will each carry twenty-six transponders. The two spacecraft will be launched in 1995 by Ariane 4 launch vehicles from the Kourou Space Center in French Guiana. The satellites will be operated by Nippon Telegraph and Telephone Corporation (NTT).

NSTAR is a three-axis body-stabilized FS-1300 series bus. Each NSTAR satellite will carry three Ka-band transponders (100 MHz wide), eight Ku-band transponders (54 MHz wide), six C-band transponders (72 MHz wide), and one S-band transponder (35 MHz wide). The two satellites will provide fixed and mobile telecommunications services in the POR, and will cover the Japanese Islands and its territorial waters.

The two N-Star satellites will be used to

replace NTT's CS-3A and CS-3B satellites which are currently operational at 132 and 136 degrees East Longitude respectively. N-Star A is scheduled to be delivered in orbit on or before April 30, 1995. N-Star B will follow on or before October 31, 1995.

The N-Star satellites will be three-axis stabilized, weighing in at a mass of about two tons at beginning of life. The antenna payload will consist of three main antennas: two 2.6 x 3.0 meter deployable reflectors and one 2.1 meter reflector. The N-Star spacecraft are expected to achieve an orbital lifetime of ten years.

Under the terms of the US\$ 600 million contract, Space System/Loral will manufacture, launch, and place the satellites into geostationary orbit in operable condition, after administering verification tests on the functions and performance of the satellites. In 1993, Space Systems/Loral successfully completed its critical design review of the N-STAR satellites, moving the program from the design to the manufacturing phase. The recent review covered all elements of the spacecraft design and performance characteristics, including the N-Star communications payloads and the attitude control, telemetry and command, power, propulsion, thermal, and structural subsystems. Space Systems/Loral will conduct the satellite ground test and final design review in late 1994.

JCSat 1 & 2

On March 6, 1989, an Ariane 44 LP rocket launched Japan Communications Satellite Corporation's first spacecraft into orbit. JCSat 2 was launched on December 31, 1989. The two satellites are owned and operated by Japan Satellite Systems Inc. (JSAT), a company established on August 17, 1993, by the merger of Japan Communications Satellite Company, Inc. (JCSAT) and Satellite Japan Corporation (SAJAC).

Both JCSAT and SAJAC were established in 1985 when the Japanese Government granted satellite operator licenses to private Japanese telecommunications companies for the very first time. Today both JCSat satellites deliver television, telephone, facsimile, and high speed data services to Japanese businesses and consumers.

Satellite Technical Description. JCSat 1 and 2 were built by the Space and Communications Group of Hughes Aircraft Company. JCSat 1 and 2 employ the Hughes HS 393 space platform design, a more powerful version of Hughes' popular HS 376 model: the world's most extensively used commercial communications satellite. The satellites have a deployed height in orbit of 10m (33 ft.) and a diameter of 3.7m (12 ft.).

The JCSat communications payload consists of thirty-two Ku-band transponders. Each transponder is capable of carrying one high-quality TV channel, a 45 Mb/s data stream, or more than 250 full-duplex telephone circuits. Each transponder has a bandwidth of 27 MHz. Individual traveling wave tube amplifiers (TWTAs) generate 20 watts of power per transponder.

A large 2.4 meter antenna and multihorn feed array produces a shaped beam covering the four main Japanese Islands and Okinawa. A nominal EIRP of 50 dBW is provided within this beam. The high power levels permit the use of Very Small Aperture Terminal (VSAT) networks. Each satellite also carries an international beam for separate coverage of Hawaii, Korea, China, Taiwan, and Singapore. In 1994, the Japanese Ministry of Posts and Telecommunications (MPT) will begin international coordination procedures for the international beam capacity on JCSat 1 and 2, with an eye toward positioning JSAT as a regional satellite operator.

JCSat Ground Segment. JSAT's dedicated Tracking, Telemetry and Control

(TT&C) station in Yokohama, Japan controls and continuously monitors the general health and performance of the spacecraft throughout its nominal ten-year lifetime. A back-up JCSat TT&C station is located in Gunma Prefecture, Japan.

Hughes Communications provided the electronics equipment for JCSat's two telemetry, tracking and control stations and trained JCSat's satellite control personnel. Hughes Communications also provided technical and marketing expertise to the company.

Broadcast & CATV Distribution. NTT uses JCSat transponders in part to distribute Tokyo-originated TV programs to local TV broadcasting companies in other Japanese cities. TV Asahi, one of Japan's major private TV broadcasting companies, operates a national network of Satellite News Gathering (SNG) vehicles that transmit live news coverage from remote locations. Many other Japanese companies use JCSat sat-

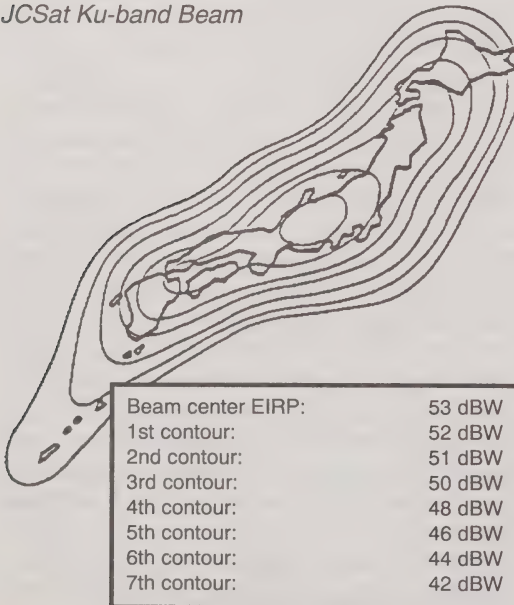
ellite transponders to distribute a variety of programs to CATV systems and hotels. Network operators such as Videosat, Skynet Communications Inc., Telecomsat Co., Ltd., and Star Communications Inc. use JCSat to provide program production and ad-hoc video transmission services.

Business Television Networks. NTT has contracted for thirteen JCSat transponders, several of which are used to transmit private video services on behalf of Japanese businesses. Nikken Satellite Company uses JCSat to send news and information related to the construction engineering field to member engineering firms located throughout Japan. This video network had 10,000 downlinks in place within the first three years of operation. Japan Business TV Co. uses JCSat to transmit a private video network that links thousands of used car dealers. During auctions, dealers can see the video images of cars and make bids by using a hand-held input device which connects the dealer with the auction center through terrestrial telephone lines. The Prep School Network of Yoyogi Seminar, one of Japan's largest preparatory schools, sends live video lectures to affiliated schools throughout the country. The religious organization Agon-shu also uses JCSat to distribute special live programs each morning to their followers throughout Japan.

VSAT Network Operations. Japan Satellite Communications Network Corporation (JSNET) provides data services to businesses throughout Japan using VSATs and a central control facility or "hub." Typical VSAT applications include data transmission, video teleconferencing, high-speed facsimile, and voice communications. JSNET expects its network to expand to more than 10,000 VSAT terminals.

Direct-To-Home Broadcasting. In April of 1992, the Japanese Ministry of Post and Telecommunications authorized six new

JCSat Ku-band Beam



JCSAT 1 & 2 International Beam Coverage

DBS broadcasters for Japan. These new broadcast services, which are carried by the Japanese Superbird and JCSat satellites, are designated as CS TV, in order to distinguish them from BS satellite users such as NHK and Japan Satellite Broadcasting (JSB). As of September, 1993, 12,597 Japanese homes were receiving TV programming from JCSat.

The CS TV broadcasters on JCSat-2 use the COATEC encryption system. These include Bisei

Biga Engeki Hoso (Japanese cinema, drama and Kabuki), Japan Sports Channel (ESPN Sports programming), and Space Shower (Japanese and Western rock video).

JCSat 3

Hughes Aircraft Company and Japan Satellite Systems Inc. (JSAT) have signed a contract for the construction and launch of a new Ku-band communications satellite. The JCSat 3 satellite, which will have a lifetime of twelve years, features four beam antennas: (1) a Ku-band Japan Beam (over 55 dBW over the Main Islands) covering all of Japan, including the Northern Territories, Senkaku islands and Ogasawara islands; (2) a Ku-band Asia Zone Beam (43 dBW) covering East Asia, Japan and South-east Asia; (3) Ku-band Spot Beam (46 dBW) coverage centered on Australia, New Zealand, and India; and (4) C-band Broad Beam (37 dBW) covering a wide area which

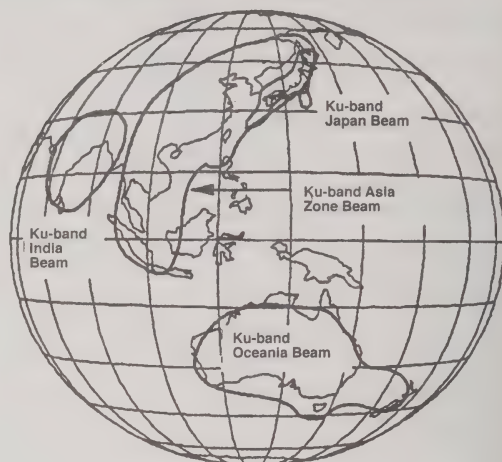


includes Eastern Asia, India, Russia, and Hawaii. Cross-strapped transponder connections between the C and Ku-band beams also will be possible. The two four-panel solar wings will provide 4,500 watts of power for the spacecraft's twenty-eight Ku-band transponders (with 60-watt TWTAs) and twelve C-band transponders (with 34-watt SSPAs).

As part of the agreement, Hughes has contracted with General Dynamics Corp., for launch aboard an Atlas 2-AS rocket in August of 1995. The satellite is expected to be located at 128 degrees East Longitude, an orbital position previously registered with the IFRB on behalf of SAJAC.



JCSat-3 C-band Coverage Zones
from 128 degrees East Longitude.



JCSat-3 Ku-band Coverage Zones
from 128 degrees East Longitude.

Japan Satellite Systems, Inc. (JSAT)

Shareholders:	ITOCHU Corp. (28.5%) Mitsui & Co. Ltd. (24%) Sumitomo Corp. (23.5%) Nissho Iwai Corp. (23.5%)
Board Members:	Relichi Yoshimoto, Chair. Yoshihide Nakayama, Pres. Masayoshi Marumo, V.P. Yasuhiko Sakamoto, V.P. Yasuharu Iwashima, Dir. Nobuo Hasegawa, Mng. Dir. Shigehiko Itoh, Auditor
Headquarters:	Shiroyama JT Mori Bldg. 27th Floor 4-3-1 Tornamon Minato-ku, Tokyo 105 Japan Tel: 5400-3832
Control Facilities:	Yokohama Satellite Control Center (YSCC) Gunma Satellite Control Station (GSCS)
Capital:	27.5 billion Yen
Established:	August 17, 1993
Coverage:	Possession, operation and control of JCSat satellites; Offers telecommunications services and domestic CS broadcasting.

Superbird A & B

On February 22, 1990, Ariane Flight V36 exploded, destroying two Japanese communications satellites—BS-2X and Superbird 1B. Arianespace engineers determined that the malfunction was caused by a foreign object which inadvertently had become lodged in the water cooling pipes of one of the Viking motors of the first stage.

On December 24, 1990, the Japanese Superbird A satellite suffered a complete systems failure. Superbird A was built by Ford Aerospace Space Systems Division of Palo Alto, California (now known as Space Systems/Loral). The spacecraft was the first of the company's third generation FS-1300 platforms which was selected by INTELSAT for its INTELSAT VII satellites. The failure probably was caused by a leakage of fuel that in turn caused a failure of the spacecraft's attitude control system.

The dramatic failure forced owner Space Communications Corporation of Tokyo (SCC) to lease capacity from Japan Communications Satellite Corp., of Tokyo, the

company's chief competitor. (Space Communications Corporation (SCC) is a joint venture of Japan-based Mitsubishi Corp. and Mitsubishi Electric Corp.) Under the agreement, the bulk of Superbird's Ku-band traffic was relocated onto the JCSat I and II spacecraft at 150 and 154 degrees East Longitude until the launch of replacement satellites.

Superbird B (R) & A(R)

On February 26, 1992, Arianespace launched its first replacement satellite—Superbird B-R (R for replacement). On December 1, 1992, Arianespace launched Superbird A (R), a replacement satellite for the original Superbird A that failed in orbit two years earlier.

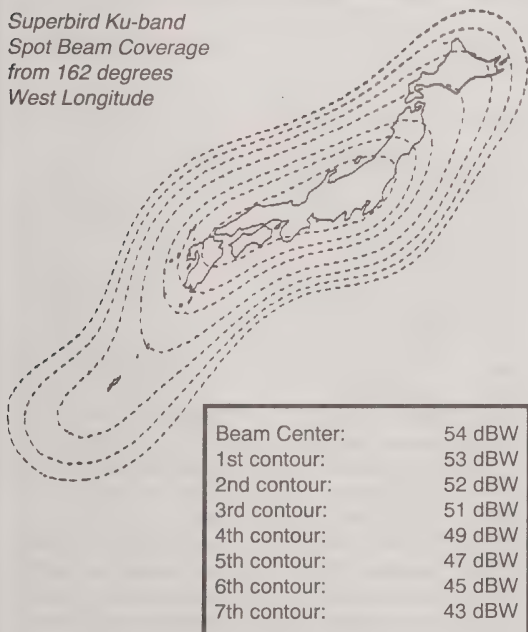
Built by Space Systems/Loral of Palo Alto, CA, each Superbird satellite weighed 2,560 kg (5,632 lb) at liftoff, and is equipped with twenty-three Ku-band transponders with 22-watt SSPAs (36 MHz wide) and

three Ka-band transponders (100 MHz wide) with 29-watt SSPAs, and two X-band transponders (40 MHz wide) with 40-watt SSPAs. The two spacecraft provide telecommunications, data transmission, and direct-to-home TV broadcasting services for the Japanese Islands from orbital locations of 158 and 162 degrees East Longitude over the Pacific Ocean.

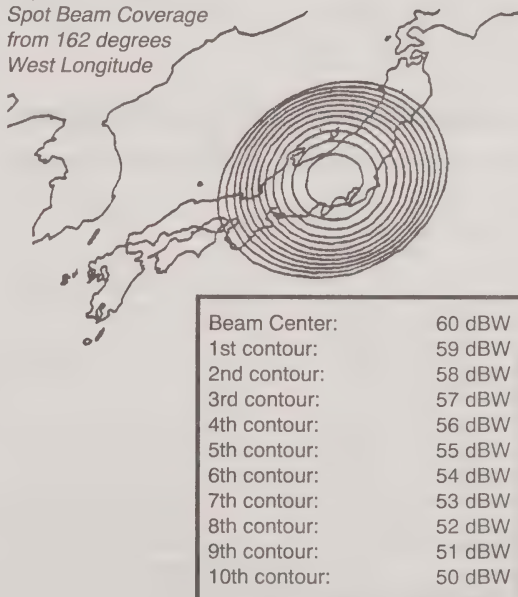
All Ku-band transponders are capable of providing all-Japan coverage. The orthogonal axes of the horizontal and vertical polarization wavefronts have been rotated 31 degrees in a counterclockwise direction to minimize rain depolarization.

The Superbird Ka-band transponders connect to a powerful Ka-band coverage beam. The X-band transponders, which are for use by Japan Self Defence Forces, connect to a global beam. Recent reports indicate that the Japanese MPT will initiate international coordination to switch the power output of the Superbird Ku-band

*Superbird Ku-band
Spot Beam Coverage
from 162 degrees
West Longitude*



*Superbird Ka-band
Spot Beam Coverage
from 162 degrees
West Longitude*



beam. The X-band transponders, which are for use by Japan Self Defence Forces, connect to a global beam. Recent reports indicate that the Japanese MPT has initiated international coordination to switch the power output of the Ku-band transponders by ground command from 22 watts to 50 watts to permit expansion of services into neighboring countries.

Direct-To-Home Broadcasting. In April of 1992, the Japanese Ministry of Post and Telecommunications authorized six new DBS broadcasters for Japan. These new broadcast services, which are carried by the Japanese Superbird and JCSat satellites, are designated as CS TV, in order to distinguish them from BS satellite users such as NHK and Japan Satellite Broadcasting (JSB). As of September, 1993, 22,946 Japanese homes were receiving TV broadcasts from Superbird.

The CS TV broadcasters on Superbird-B use the SKYPORT Encryption system. These broadcasters include: Japan Cable Television (CNN International), Star Channel (Western cinema), Music Television, and Power Channel.

Gross National Product: US\$ 5.79 billion
(Estimated 1993)
Language(s): Arabic
Religion: Muslim
Time Standard: GMT+2
Currency Standard: Dinar (0.68 = US\$ 1)
Video Standard: PAL
Electrical System: 220 A.C., M 50 Hz.
Telephone Country Code: (962)
Major City Telephone Codes:
Irbid - 2
Aqaba, Maan, Karak - 3
Ajlun, Jarash, Mafraq - 4
Salt - 5
Amman - 6
Tafileh - 7
Madaba - 8
Zarqa - 9

INTELSAT REPRESENTATIVE:

Telecommunication Corporation

(JORTEL AMAN)
P.O. Box 1689
Amman, Jordan
Mr. K. Wadi, Operations Representative
Tel: 962-6-622-228 or 639-306/7

EARTH STATIONS:

BAQA 1 - 60° E
BAQA 2 - 335.5° E

SATELLITE COMPANIES:

Pan Arab Satellite Systems (PASS)

Dana Center - Al-Medinah Al-Munawarah Str.
First Floor Office No. 102
POB 1592 Amman
Jordan
Nadeem Khoury, President
Nabila Khoury, Vice President
Tel: (962) 6-614-128
Fax: (962) 6-61428

PASS offers total communications systems solutions using satellites for establishment of domestic, regional, and international links for a variety of services. Based on extensive working experience for over two decades in the satellite communications field, PASS is able to handle turnkey projects starting with theoretical link analysis and ending up with supply, installation, operation and maintenance of relevant ground segment facilities. Since 1987, PASS

JORDAN



Government: Constitutional
Monarchy
Population: 3,700,000

has been intensively involved with the United States Information Agency (USIA) for the installation and maintenance of satellite TV and wireless file satellite equipment at various Posts/Embassies around the globe. Since 1990, PASS has been responsible for all the satellite related projects of Radio Orient, Paris, France.

INTELSAT REPRESENTATIVE:
Ministry of Communications

134 Bogenbay Betyr Street
Alma-Ata 480091

Kazakhstan

Mr. Alexander Mitikhin

Head of SATCOM & Licensee Department

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Fax: (7) 3272-637-210

MAIN Tel: (7) 3272-627-979, 623-194

MAIN Fax: (7) 3272-637-210

KAZAKHSTAN


TELECOM TRADE SHOW:

Kazakhstan International Telecommunications
Exhibition '94

19 Novo-Basmannaya St. Moscow 107882

Tel: (7) 95-267-1504

Fax: (7) 95-267-1504

KYRGYZSTAN



Government: Republic
(CIS Member)

Population: 17,093,000

Gross National Product: US\$ 65.6 billion
(Estimated 1993)

Language(s): Russian, Kazakh

Religion: Muslim, Christian
Orthodox

Time Standard: GMT+6, GMT+5 in
Aktyubinsk, Uralsk,
Shevchenko,
Kzyl-Orda, Guryev,
and Rudny

Currency Standard: Rouble
(1.65 = US\$ 1)

Video Standard: SECAM

Electrical System: 127/220 a.c., 50 Hz.

Telephone Country Code: (7)

Major City Telephone Codes: None

Government: Republic
(member of CIS)

Population: 4,550,000

Gross National Product: US\$ 13.8 billion

Language(s): Kyrgyz, Russian,
Uzbek

Religion: Muslim, with
Orthodox Christian
minority

Currency: Ruble
(1.65 = 1 US\$)

Time Standard: GMT+6

Video Standard: SECAM

Electrical System: 127/220 a.c., 50 Hz.

Telephone Country Code: (7)

Major City Telephone Codes: None

INTELSAT REPRESENTATIVE:**Ministry of Post and Telecommunications**

720000, Beshkek Centre

Leninsky PR-T 9

Kyrgyzstan

Mr. Abduvaliev Ruben

Head, Microwave, Radio and Television

Tel: 22-20-34/22-40-00

Fax: 7-331-226-23-28/331-221-26-63

KIRIBATI

Government: Republic,
Commonwealth
Member (U.K.)

Population: 73,000

Gross National Product: US\$ 55.6 million
(Estimated 1993)

Language(s): Ikiribati, English

Religion: Christian, Baha'i

Time Standard: GMT-11

Currency Standard: Australian \$
(1.51 = US\$ 1)

Video Standard: None

Electrical System: 240 a.c., 50 Hz.

Telephone Country Code: (686)

Major City Telephone Codes: None

INTELSAT REPRESENTATIVE:**Telecom Services Kiribati Ltd.**

P.O. Box 72

Tarawa, Kiribati

Mr. Robert J. Heron

Chief Executive Officer

Tel: 686-21446

Fax: 686-21424

Main Tel: 686-21287

EARTH STATIONS:

BAIRIKI - 174° E (TRW)

CHRISTMAS IS. - 174° E (TRW)

LONDON E/S - 174° E (TELECOM SERVICES)

KOREA (NORTH)

Government: Socialist State

Gross National Product: US\$ 22.5 billion
(1993 estimate)

Population: 212,650,000

Language(s): Korean

Religion: Atheist

Time Standard: GMT+9

Currency Standard: Won (0.97 = US\$ 1)

Video Standard: PAL (D)

Electrical System: 220 a.c., 50 Hz.

Telephone Country Code: (850)

Major City Telephone Codes: None

Number of TV Sets: 245,000

INTELSAT REPRESENTATIVE:**Deprelint Pyongyang**

Tel: (850) 2-36-344

EARTH STATION:

INTELSAT IOR 60° E (Pyongyang)

BROADCAST ORGANIZATION:**Korean Central TV**

c/o Ministry of Posts and Telecommunications

Pyongyang, Pyonayana

North Korea

KOREA (SOUTH)



Government: Republic
 Population: 43,830,000
 Gross National Product: US\$ 260.4 billion
 (1993 estimate)
 Language(s): Korean
 Religion: Buddhist,
 Confucian,
 Christian
 Time Standard: GMT+9
 Currency Standard: Won
 (793.82 = US\$ 1)
 Video Standard: NTSC (M)
 Electrical System: 220 a.c., 50 Hz.
 Telephone Country Code: (82)
 Major City Telephone Codes:
 Seoul - 2
 Incheon - 32
 Taejon - 42
 Pusan - 51
 Taegu - 53
 Kwangju - 62
 Suwon - 331
 Chonju - 431
 Masan - 551
 Ulsan - 522

Number of TV Sets: 12,500,000

INTELSAT REPRESENTATIVE:

DACOM

Sun-Ji Bldg 40-712,
 3-Ga, Hangang-Ro
 Seoul 140-013
 South Korea
 Mr. Moon-Ho Lee
 Manager, International Leased Services Section
 Tel: 82-2-220-5231
 Fax: 82-2-796-8811

INTELSAT/INMARSAT OPERATIONS
REPRESENTATIVE:

Korea Telecommunications Authority (KTA)

4603 Myungil-Dong
 Seoul 134-070 Korea
 Myung-Soo Rhee, Director
 Kwang-Young Kim, Mng. Dir.
 Sang Bok Lee, Vice President
 Tel: 82-2-750-3730
 Fax: 82-2-750-3722

EARTH STATIONS: ASAN 1 - 180° E (DACOM)
 ASAN 2 - 63° E (DACOM)
 BOEUN 1 - 174° E (KTA)
 BOEUN 2 - 63° E (KTA)
 BOEUN 3 - 174° E (KTA)
 KUM SAN 1 - 177° E
 (MINISTRY OF COMM.)
 KUM SAN 2 - 60° E
 (MINISTRY OF COMM.)
 KUM SAN 3 TVRO - 177° E
 (MINISTRY OF COMM.)
 KUM SAN 5 - 60° E (KTA)
 SDA 1 - 174° E (DACOM)
 SEOUL 1 - 174° E (KTA)
 SEOUL 2 - 177° E
 (MINISTRY OF COMM.)
 INMARSAT POR - KUMSAN

In addition to the above-mentioned international earth stations, Korea also has eight domestic earth stations which interface using the INTELSAT satellites at 174 and 177 degrees East Longitude.

BROADCAST ORGANIZATIONS:

Korean Broadcasting System (KBS)

18 Yoido-Dong
Youngdungpo-Gu
Seoul 150-790
Tel: (82) 2-781-1000
Fax: (82) 2-785-2499

Munhwa Broadcasting Corporation (MBC)

31 Yoido-Dong
Youngdungpo-Gu
Seoul 150-728 Korea
Tel: (82) 2-784-000
Fax: (82) 2-782-3094

REGULATORY ORGANIZATION:

Ministry of Communications

100 Sejong-no
Chongno-ku
Seoul 110-777
Soon Sik Shin, Deputy Dir.
Tel: (82) 2-750-2811

SATELLITE EQUIPMENT

MANUFACTURERS & DISTRIBUTORS:

DACOM Corporation

140-716 DACOM Bldg.
65-228, 3-Ga
Hanzang-Ko
Yongsin-Ku, Seoul Korea
Yun-sik Shin, President
Kyung-bae Kim, Senior Exec. V.P.
Seong-yong Jo, Exec. V.P.
Jung-hoon Lee, Mng. Dir.
Tel: (82) 2-220-0220
Fax: (82) 2-796-8500

DACOM, since its establishment in 1982, has been playing a key role as a general telecom service provider in Korea. The major services provided are international telecom service, leased line service, data network service, etc. The vision of DACOM is to become one of the prominent global common carriers.

Daeyoung Electronics Ind Co. Ltd.

152 Dangeong-Dongs
Gunpo-Si
Kyoungki-do, South Korea
Tel: (82) 2-790-6873
Fax: (82) 2-790-6878

Eye Electronics Co. Ltd.

7-2, Namgae-Dong, Yangmok-Myeon
Chilgouk-Gun,
Kyung-Buk, Korea
Sung Jo Park
Director / Chief Engineer,
Electronics R & D Div.
Tel: (82) 545-971-3271
Fax: (82) 545-971-3275

Gana Corporation

320 Gong Dan Dong
Gumi, Kyung Sang Buk-do
730-030 Korea
John H. Oh, Marketing Manager
Tel: (82) 546-463-5307
Fax: (82) 546-461-8588

Goldstar Information & Comm. Ltd.

Luck-Goldstar Twin Tower
20, Yoido-dong
Youngdungpo-gu
Seoul 150-721 Korea
Kwang - Hyun Lee
Assistant Manager
International Marketing Dept.

Products manufactured: Satellite receivers and satellite sub-systems. Goldstar is a sub-contractor on the Koreasat satellite project.

Hanshin Machinery Co. Ltd.

Tae Hoi Kim
Project Manager/Electronics Div.
Yoido P.O. Box 128,
Seoul, Korea
Tel: 2-233-5231~3, 516-9352
Fax: 2-540-6551, 345-491-3916

Hyunkwang Electronics & Telecommunications, Inc.

#188-6 Suyu 3 Dong
Dobong-ku
Seoul Korea
Sungku Lee, President
Haewoon Lee, Executive V.P.
Dongshin Chang, Marketing Director
Tel: (82) 2-908-0861
Fax: (82) 2-900-1430

Products manufactured: LNBs, RF and MF Sub Systems.

Hyundai Electronics Ind. Co., Ltd.

KPO Box 626 SE
Seoul 110-052
Korea
Kim Dohyum, Section Chief

Satellite receiver manufacturer

Samsung Electronics

Joong-ang Daily News bldg.
7, Soonwha-Dong, Chung-Ku
C.P.O. Box 2775
Seoul Korea
Young-Kil Lee, General Mgr.,
New Media Division
Tel: (82) 2-751-6644
Fax: (82) 2-751-6591

Telexmax Co. Ltd

No. 603-2, Mok 3-Dong
Yangchun-ku
Seoul 158-053 South Korea
Yong Man Kim, Mng. Dir.
Jennie A. Ko, Export Manager
Tel: (82) 2-651-8112
Fax: (82) 2-652-3288

Products manufactured: LNBs, Receivers, Antenna
Positioners. Telexmax is a leading manufacturer of
satellite receiving systems.

SATELLITE CONSULTANTS:**Electronics and Telecommunications
Research Institute (ETRI)**

P.O. Box 8, Daeduk Science Town
Daejeon, Korea
Myeong-Cheol Park, PhD., Head,
Telecom Management Section
Tel: (82) 42-860-6849
Fax: (82) 42-860-6504
Jae-Moung Kim, Director, Satellite Comm.
System Dept.
Tel: (82) 42-820-6815
Fax: (82) 42-861-1033

Radio Research Laboratory

Ministry of Communications
1215 Communications Centre
100 Sejong-Ro, Jongro-Gu
Seoul, Korea
Mr. Jai-Lim Yuk, Chief of Radio
Waves Division
Tel: (82) 2-750-2352
Fax: (82) 2-750-2354

The Koreasat Domestic Satellite System

In April of 1995, the first of two Ku-band Koreasat communications satellites will be launched from Cape Canaveral, Florida, atop a McDonnell Douglas Delta II rocket. A second Koreasat satellite will follow in October of 1995. Known in Korea as Mugunghwa—the Korean national flower—the two-satellite domestic communications system is being manufactured for the government of South Korea by Martin Marietta Astro - Space of the United States in partnership with Matra Marconi Space U.K. Korean manufacturing involvement in the project will include work by locally-based subcontractors such as Goldstar Information and Communications Ltd., of South Korea (satellite hardware) and Korean Air (external structural components).

The 3,000 lb. Koreasat -1 and Koreasat-2 domestic telecommunication satellites, to be collocated at 116 degrees East Longitude, will transmit in both Fixed Satellite Service (FSS-12.25 ~12.75 GHz downlink) and Broadcast Satellite Service (BSS-11.70~12.00 GHz downlink) Ku-band frequency spectrums assigned for domestic satellite operations within ITU Region 3. Both satellites will have a mission lifetime of ten years.

The Koreasat communications satellites will be used to relay direct broadcast television, telephone, private business, and mobile telecommunication signals on behalf of

Koreasat FSS Beam



Peak EIRP:	53.2 dBW	3rd contour:	45.2 dBW
1st contour:	51.2 dBW	4th contour:	43.2 dBW
2nd contour:	49.2 dBW	5th contour:	33.2 dBW

Koreasat BSS Beam



Peak EIRP:	62.4 dBW	3rd contour:	54.4 dBW
1st contour:	60.4 dBW	4th contour:	52.4 dBW
2nd contour:	58.4 dBW	5th contour:	42.4 dBW

users throughout South Korea. The total system cost for Korea's first operational domestic satellite system will be about US\$ 140 million.

The satellite bus will be based on the MM 3000 three-axis stabilized model developed

by Martin Marietta Astro - Space. The communications payload, which will be built by Matra Marconi, will consist of fifteen Ku-band transponders—twelve 36-MHz-wide transponders (using linear polarization) for general use and three 27-

MHz-wide transponders (using left-hand circular polarization) for direct broadcast services.

The FSS Ku-band beam will be approximately 1 degree in diameter, boresighted onto the Earth coordinates of 127.5° East Longitude and 36° North Latitude. The satellite's 12-watt FSS TWTAs will produce an EIRP of 50.2 dBW and a G/T of 13.5 dB/K at edge of coverage. The BSS Ku-band beam will have a major axis of less than 1.24 degrees and a minor axis of less than 1.02 degrees. Each satellite's 120-watt BSS TWTAs will produce an EIRP of 59.4 dBW and a G/T of 13 dB/K at edge of coverage. DBS receiving stations will be able to use antennas which are 30 to 60cm in diameter to receive the Koreasat DBS TV broadcasts.

Matra Marconi Space (MSS) in Portsmouth, England, also will be responsible

for constructing the Koreasat network control center and telemetry, tracking, and command stations in the suburbs of Seoul. The new system will provide ample capacity for advanced telephone, Broadcast TV, and mobile communications.

Koreasat At A Glance

Operational History

Launch Date:	<u>April & October 1995</u>
Orbital Assignment:	<u>116 degrees East Longitude</u>
Launch vehicle:	McDonnell Douglas Delta II
Mission Lifetime:	Ten years

Communications Payload

Uplink bands:	14.0~14.5 GHz (FSS) 14.5~14.8 GHz (BSS)
Downlink bands:	12.25~12.75 GHz (FSS) <u>11.7~12.0 GHz</u> (BSS)
Telemetry Frequencies:	12.25125, 12.25175, and 12.74875 GHz
No. of Transponders:	12 (FSS) & <u>3 (BSS)</u>
Transponder bandwidth:	36 MHz (FSS) and <u>27 MHz (BSS)</u>
TWTA power amplifiers:	12-watt (FSS) and 120-watt (BSS)
Coverage beam:	Korea and surrounding area
EIRP (edge of coverage):	50.2 dBW (FSS) & <u>59.4 dBW (BSS)</u>
G/T (edge of coverage):	13.5 dB/K (FSS) & 13 dB/K (BSS)

Spacecraft Specifications

Spacecraft Type:	MM 3000 Three-axis stabilized
Spacecraft Manufacturer:	Martin Marietta Astro - Space
Dimensions:	1.42 x 1.95 x 1.73m with 15m solar wing span
Dry Weight:	612kg

KUWAIT

Government: Emirate
 Population: 2,370,000
 GNP: US\$ 36 billion
 Language(s): Arabic
 Religion: Muslim
 Currency: Kuwaiti dinar
 (0.29 = 1 US\$)
 Time Standard: GMT+3
 Video Standard: PAL
 Electrical System: 240 a.c., 50 Hz.
 Telephone Country Code: (965)

INTELSAT REPRESENTATIVE:**USPTT Kuwait**

P.O. Box 318
 11111 Safat
 Kuwait
 Mr. Abdul Rahman Al-Shatti, Director,
 International Network, Ministry of Comm.
 Tel: (965) 830-488
 Fax: (965) 484-8883

INTELSAT EARTH STATIONS:

KAIFAN - 18° WEST
 MUSHRIF - 60° EAST
 UMM QSAR 1 - 66° EAST

Also C and Ku-band transportable uplinks

BROADCAST ORGANIZATIONS:

Kuwait Television
 P.O. Box 193
 Safat 13007
 Kuwait

LAOS

Government: People's Republic
 (Communist)
 Population: 4,300,000
 Language(s): Lao, Khmu
 Religion: Buddhism
 Currency: Kip
 (716.84 = 1 US\$)
 Time Standard: GMT+7
 Video Standard: PAL (M)
 Electrical System: 127/220 a.c., 50 Hz.
 Telephone Country Code: (856)
 Major City Telephone Codes: None
 Number of TV Sets: 340,000

INTELSAT REPRESENTATIVE:**EPTL Laos**

Tel: (856) 4499

EARTH STATIONS:

INTELSAT LAOS 1 - 63° E IDR VISTA
 INTERSPUTNIK - 80° E (Near Vietnam)

BROADCAST ORGANIZATIONS:**Laos National TV (LNT)**

P.O. Box 310
 Vientiane
 Tel: (856) 5609/4475

REGULATORY ORGANIZATION:

**Committee On Information, Press, Radio
 and TV Broadcasting**
 Vientiane

LEBANON



Government: Republic
 Population: 3,480,000
 Gross National Product: US\$ 1.96 billion
 (Estimated 1993)
 Language(s): Arabic, Armenian
 Religion: Muslim, Maronite,
 Druze
 Time Standard: GMT+2
 Currency Standard: Livre
 (2,475 = US\$ 1)
 Video Standard: SECAM
 Electrical System: 110/190 a.c., 50 Hz.
 Telephone Country Code: (961)
 Major City Telephone Codes: None

INTELSAT REPRESENTATIVE:**Ministry of PTT (PTT BEIRUT)**

Corniche Al Nahr
 Beirut, Lebanon
 Mr. E. El-Khoury
 Director General
 Tel: 751-1-424-488 or 751-1-39614

EARTH STATIONS:

BEIRUT 1 - 359° E (PTT)
 JOURET EL BALLOUT 1 - 342° E (PTT)
 NAQQURA 2 - 66° E (UNITED NATIONS)

MACAU

Government: Overseas territory
 of Portugal
 Population: 460,000
 Gross National Product: US\$ 3.16 billion
 Language(s): Chinese
 (Cantonese),
 Portuguese, English
 Religion: Buddhist, 6%
 Roman Catholic
 minority
 Time Standard: +8 GMT
 Currency Standard: Pataca
 (N/A = US\$ 1)
 Video Standard: PAL (I)
 Electrical System: 110/220 a.c., 50 Hz.
 Telephone Country Code: (853)
 Major City Telephone Codes: None
 Number of TV Sets: 32,000

INTELSAT REPRESENTATIVE:**Telemac**

Tel: (853) 551-881

EARTH STATIONS:

MACAU 1 - 60° E
 MACAU 2 - 174° E

BROADCAST ORGANIZATIONS:**Teledifusão De Macau (TDM) S.A.R.L.**

Avenida Dr. R. Rodrigues, Edif.
 Nam Kwong
 7 Andar, Macau
 Macau
 Tel: (853) 516-078
 Fax: (853) 343-199

MALAYSIA



Government: Constitutional monarchy, commonwealth member (U.K.)

Population: 18,900,000

Gross National Product: US\$ 43.2 billion

Language(s): Malay, Chinese, English, and Indian

Religion: Muslim, with 17% Buddhist, 7% Hindu, and 6% Christian minorities

Time Standard: +8 GMT

Currency Standard: Ringgit (2.52 = US\$ 1)

Video Standard: PAL (B)

Electrical System: 230/400 a.c., 50 Hz.

Telephone Country Code: (60)

Major City Telephone Codes:

- Kuala Lumpur - 3
- Alor Star - 4
- Taiping, Ipoh - 5
- Malacca, Seremban - 6
- Johore Bahru - 7
- Kota Bahru, Kuala Trengganu, Kuantan - 9
- Kuching - 82
- Kota Kinabalu - 88

Number of TV Sets: 2,500,000

INTELSAT REPRESENTATIVE:

Telekom Malaysia
(STM TELEKOM)
15th Floor, Wisma Telekom
Jalan Pantai Baru
59200 Kuala Lumpur
Malaysia

Mr. D.V. Managey
Assistant General Manager
Operations Representative:
Ahmad Kamal, Manager,
Broadcast Services,
Business Mkt.
Tel: (60) 3-232-9494 x 2060
Fax: (60) 3-755-7316 or 718-6078

Telekom Malaysia

Jalan Pantai Baru
59200 Kuala Lumpur
Malaysia
Mr. Zaini Dimen
Group Manager
Satellite News Services
Tel: (60) 3-232-9494, ext. 2060
Fax: (60) 3-755-7316 or 718-6078

EARTH STATIONS:

ANGKASAPURI 1 - 63° E
(RTM MALAYSIA TV)
ANGKASAPURI 2 - 174° E
(RTM MALAYSIA TV)
ANGKASAPURI 3 - 60° E
(RTM MALAYSIA TV)
BERNAMA 1 - 63° E
(PERT. BERITA NAT'L)
BERTNAMA 2 - 63° E
(PERT. BERITA NAT'L)
GLUGOR 1 - 174° E
(STM TELEKOM)
GLUGOR 2 - 63° E
(STM TELEKOM)
KOTA KINABALU - 174° E
(DGTT)
KUANTAN 1 - 63° E
(STM TELEKOM)
KUANTAN 2 - 174° E
(STM TELEKOM)
KUANTAN 3 -
MELAKA 1 - 60° E
(STM TELEKOM)
MELAKA 2 - 63° E
(STM TELEKOM)
WANGSA MAJU 1 - 174° E
(STM TELEKOM)
WANGSA MAJU 2 - 63° E
(STM TELEKOM)

REGULATORY ORGANIZATION:**Ministry of Energy, Telecommunications and Posts**

Wisma Damansara
Ground Floor
Jalan Semantan
Kuala Lumpur 50668
Tel: (60) 3-254-6677
Fax: (60) 3-255-7901

TVRO Legal Status: Not Legal
Estimated TVRO systems: 22,000 (illegal)

BROADCAST ORGANIZATIONS (Satellite Users):**TV3**

Sistem Televisyen Malaysia Berhad
7 - 9th FL, KUB Bldg.
No. 1 Lorong Kapar
P.O. Box 11124
Kuala Lumpur 50736
Malaysia
Tel: (60) 3-274-3111
Fax: (60) 3-274-8896

TV1

Radio TV Malaysia (RTM)
Department of Broadcasting
Ministry of Information
Angkasapuri
Kuala Lumpur 50614
Malaysia
Dato Jaafar Kamin, Director General
Othman MD. said, Engineering Controller
Tel: (60) 3-274-5333
(60) 3-282-3140
Fax: (60) 3-230-4735
(60) 3-282-4735

INTERNATIONAL BROADCASTING ORGANIZATION:**Asia-Pacific Broadcasting Union**

(ABU) P.O. Box 1164
Pejabat Pos Jalan Pantai Bharu
Kuala Lumpur 59700
Malaysia
Tel: (60) 3-282-3592
Fax: (60) 3-230-5292

SATELLITE COMPANIES:**Bihaiang SDN BHD**

2nd Floor, Wisma Ali Bawal II
11, Jalan Tandang, Petaung Jaya 46050
Sewangor, Malaysia
Mr. Kooteng Bin, Director/Chairman
Mr. Noordin Baharuddin, Mng. Dir.
Mr. Tan Poh Keat, Advisor
Mr. Ali R. Eradi, Tech. Mgr.
Tel: (60) 3-794-2000
Fax: (60) 3-794-2371, 791-3993

Services provided: Satellite system operator.

Communications & Satellite Service

2nd Fl., Wisma Ali Bawal 11
Jln Tandang
Petaling 46050
Jaya Malaysia

DATA CO (M) SDN. BHD

17th Fl., Plaza Atrium, Lorong P. Ramlee,
50250 Kuala Lumpur Malaysia
Harold Nettleton, Mng. Dir.
Tel: (60) 3-238-9157
Fax: (60) 3-238-9163

Federal Telecommunications SDN BHD

Lot 2, Jalan 222, Section 51A
46100 Petaling Jaya
Selangor Darul Ehsan
Malaysia
Tel: (60) 3-756-0255
Fax: (60) 3-756-8888

Industronics SDN BHD

7 Jalan Manis 4
Taman Segar
56100 Kuala Lumpur Malaysia
Dr. J.C. Lim, Mng. Dir.
Mr. Edwin Gan, General Mgr.
Mr. Annuar Saibi, Proj. Eng., Sat. Div.
Tel: (60) 3-930-1411
Fax: (60) 3-971-7357

Products distributed: Satpak, VSATs, TVRO, and SCPC receivers.

Superior Communications

9th Floor, Wisma KLI
 126, Jalan Bukit Bintang
 55100 Kuala Lumpur
 Malaysia
 Abu Bakar Sharif, Exec. Dir.
 Zulkeflee Khalidin, Marketing Mgr.
 Rokiah Abu Rasan, Bus. Dev. Mgr.
 Ahmad Azahar Talib, Comm. Eng.
 Tel: (60) 3-242-8151
 Fax: (60) 3-242-2052

Products distributed: TVRO systems by Echosphere,
 Satcom modems by Fairchild Data Corporation;
 services provided: equipment representative, engi-
 neering services, and system integration for tele-
 communications projects.

MALDIVES

Government:	Republic
Population:	240,000
Gross National Product:	US\$ 125 million (Estimated 1993)
Language(s):	Divehi
Religion:	Muslim
Time Standard:	GMT+5
Currency Standard:	Rufiyaa (10 = US\$ 1)
Video Standard:	N/A
Electrical System:	N/A
Telephone Country Code:	(960)

INTELSAT REPRESENTATIVE:**Department of Posts
and Telecommunications**

POSTEL Building
 Male, Maldives
 Mr. Riluvan Shareet, Director General
 Tel: (960) 32-3455
 Fax: (960) 32-0000

INTELSAT OPERATIONS REPRESENTATIVE:**DHIRAAGU PVT LTD.**

Tel: (960) 322-802
 Fax: (960) 332-2800

INTELSAT EARTH STATION:

VILLINGILI 1 - 60° E (DHIRAAGU)

MONGOLIA

Government:	Republic
Population:	2,370,000
Gross National Product:	US\$ 4.17 billion (1993 estimate)
Language(s):	Mongolian, Kazakh
Religion:	Atheist
Currency Standard:	Tugrik (42 = US\$ 1)
Time Standard:	GMT+8, GMT+7 Ulaangom, Uliastay
Video Standard:	SECAM (I)
Electrical System:	220 a.c., 50 Hz.
Telephone Country Code:	(976)
Major City Telephone Codes:	None
Number of TV Sets:	125,000

INTELSAT REPRESENTATIVE:**Cable and Wireless Plc**

c/o Mongolian Telecomms Authority
 Ulan Bator
 Mongolia
 Tel: 976-123-3010

INTELSAT OPERATIONS:**Mongolian Telecommunications Co.**

Tel: 248-55

EARTH STATIONS:

INTELSAT: NARAN - 60° E
 INTERSPUTNIK - 80° E (Near Ulan Baator)

BROADCAST ORGANIZATIONS:**Mongolteleviz**

Mongolian TV Center
 Hasbaatar Street
 Ulan Bator 11
 Mongolia

NEPAL



Government: Constitutional Monarchy
 Population: 20,560,000
 Gross National Product: US\$ 3.84 billion (1993 estimated)
 Language(s): Nepali, Maithali, Bhojpuri and English
 Religion: Hindu, Buddhist
 Time Standard: GMT+5.75
 Currency Standard: Nepalese rupee (42 = US\$ 1)
 Video Standard: PAL (B)
 Electrical System: 220 a.c., 50 Hz.
 Telephone Country Code: (977)
 Major City Telephone Codes: None
 Number of TV Sets: 260,000

INTELSAT REPRESENTATIVE:

Nepal Telecom Corp.
 (Telecom Kathmandu)
 International Telecom Building
 Kathmandu, Nepal
 Mr. C. P. Bhattarai
 International System Manager
 Tel: 977-1-216-646 or 212-784
 Fax: 977-1-223-519

INTELSAT EARTH STATION:

SAGARMATHA - 60° E

BROADCAST ORGANIZATIONS:

Nepal Television (NTV)
 P.O. Box 3826
 Singha Durbar
 Panchayat Plaza
 Kathmandu
 Tel: (977) 2-22-84-47
 Fax: (977) 1-22-83-12

NEW ZEALAND



Government: Commonwealth member (U.K.)
 Population: 3,336,000
 Gross National Product: US\$ 42 billion
 Language(s): English
 Religion: Christian
 Time Standard: GMT+12
 Currency Standard: NZ \$ (NZ\$ 1.80 = US\$ 1)
 Video Standard: PAL
 Electrical System: 230/400 a.c., 50 Hz.
 Telephone Country Code: (64)
 Major City Telephone Codes:
 Christchurch - 3
 Wellington - 4
 Auckland - 9
 Invercargill - 21
 Dunedin - 24
 Nelson - 54
 Palmerston North - 63
 Wanganui - 64
 New Plymouth - 67
 Napier-Hastings - 70
 Hamilton - 71
 Gisborne - 79

Whangarei - 89

INTELSAT REPRESENTATIVE:

Telecom New Zealand International

P.O. Box 795
Wellington, New Zealand
Mr. Alex Nisbet
Manager, Program Booking Centre
Telecom Networks and Ops.
Tel: (64) 4-473-0085
Fax: (64) 4-471-1303
MAIN Tel: (64) 4-498-9069
MAIN Fax: (64) 4-473-1399

INTELSAT EARTH STATIONS:

RANGIORA 2 - 177° E
(TELECOM NETWORKS INT. LTD.)
SCOTT BASE - 174° E
(TELECOM NETWORKS INT. LTD.)
TVC 1 - 177° E (TVNZ LTD.)
WARKWORTH 1 - 177° E
WARKWORTH 2 - 174° E
WELLINGTON 1 - 177° E

C-BAND TRANSPORTABLE

In addition to the above-mentioned international earth stations, New Zealand also has 6 domestic earth stations which interface using the INTELSAT satellites at 174, 177 and 180 degrees East Longitude.

**SECONDARY INTELSAT
OPERATIONS REPRESENTATIVE:**

Clear Communications

Tel: (64) 9-358-0189
Fax: (64) 9-358-2379

INTELSAT EARTH STATIONS:

CLEAR 1 - 180° E (IBS IDR)
CLEAR 2 - 177° E (IBS IDR)

BROADCAST ORGANIZATIONS:

Broadcast Communications Ltd.

Level 5, Quay Tower
29 Custom St.
P.O. Box 2495, Auckland
New Zealand
Tel: (64) 9-367-1400
Fax: (64) 9-379-2895

Sky Network Television Ltd.

10 Panorama Rd., Mt. Wellington
P.O. Box 9059
Newmarket, Auckland
New Zealand
Brian Green, Director of Engineering
Tel: (64) 9-579-9999
Fax: (64) 9-525-8324

Television New Zealand

100 Victoria Street West
P.O. Box 3819
Auckland, New Zealand
Lewis Woodburn, Satellite Ops. Mgr.
John West, Bookings Mgr.
Tel: (64) 9-3700-630
Fax: (64) 9-3750-979

Television New Zealand is New Zealand's leading broadcaster and operates two television channels: Television One and Channel 2. Television New Zealand also is an INTELSAT registered service provider. TVNZ operates global beam leases on the POR 180 and IOR 57 degrees East satellites for television services. Dedicated uplinks are available in Australia, New Zealand, Hong Kong, Great Britain and the USA. Others arranged upon request.

TV3 Network Services Ltd.

CANWEST GLOBAL SYSTEM
Private Bag 92624
Symonds Street
Auckland, New Zealand
Ken Clark, President & CEO
Gerry Noble, V.P.
Gerry Smith, Dir. of Eng. & Ops.
Rod Peterson, Dir. of News
Tel: (64) 9-377-9730
Fax: (64) 9-302-2321

TELECOM PUBLISHER:**Coop's Technology Digest**

P.O. Box 330

Mangonui, Far North

New Zealand

Robert B. Cooper, Managing Director

Tel: (64) 9-406-0651

Fax: (64) 9-406-1083

Services provided: Publishes Coop's Technology Digest (ten issues per year) and Tech Bulletin (five issues per year) for the South Pacific Region satellite/broadcast/consumer electronics industries. Free sample copies are available upon request.

Southsat Communications Ltd.

245 Barbadoes Street

Christchurch 1

New Zealand

Gary McNeill, Director

Haimish McNeill, Sales

Tel: (64) 377-2507

Fax: (64) 379-0806

Products manufactured: antennas.

Telecom New Zealand International Ltd.

Telecom Networks House

68-86 Jervois Quay, P.O. Box 1092

Wellington, New Zealand

Trevor Archer, Broadcast Business Manager

Tel: (64) 4-498-9067

Fax: (64) 4-498-9115

TVRO MANUFACTURERS/DISTRIBUTORS:**Telsat Communications Ltd.**

P.O. Box 1537

Palmerston North

New Zealand

Selwyn Cathcart, Mng. Dir.

Terry Cathcart, Secretary

Fax: (64) 6-355-2141

Products distributed: TVRO products by Orbitron, Drake, Gardiner, National ADL, Winner, Venture, California Amplifier, and Chaparral Communications; services provided: Consulting, supplying and installing TVRO systems covering New Zealand and all Pacific Islands.

OMAN

Government:	Sultanate
Population:	1,640,000
Language(s):	Arabic, Baluchi, Mehri
Time Standard:	GMT+4
Currency Standard:	Rial (0.38 = US\$ 1)
Video Standard:	PAL
Electrical System:	220 a.c., 50 Hz.
Telephone Country Code:	(968)
Major City Telephone Codes:	None

INTELSAT REPRESENTATIVE:**Sultanate of Oman Television**

5454 OMAN

Khamis Bin Ahmed Al-Musafir

Director General

Tel: (968) 601-936

Fax: (968) 605-032

OPERATIONS:**GENTEL OMAN (GTO)**

Tel: (968) 697-851

INTELSAT EARTH STATIONS:

AL AMERAT - 60° E (GTO)

MASIRAH 1 - 60° E (GTO)

OMA-P1 - 63° E (PTT)

PAKISTAN



Government:	Islamic Republic
Population:	123,400,000
Language(s):	Urdu, Punjabi, Sindhi, Pushtu, Baluchi
Religion:	Muslim
Time Standard:	GMT+5
Currency Standard:	Rupee (29.42 = US\$ 1)
Video Standard:	PAL (B)
Electrical System:	230/400 a.c., 50 Hz.
Telephone Country Code:	(92)
Major City Telephone Codes:	
Karachi - 21	
Lahore - 42	
Rawalpindi, Islamabad - 51	
Multan - 61	
Hyderabad - 221	
Faisalabad - 411	
Gujranwala - 431	
Sialkot - 432	
Sargodha - 451	
Peshawar - 521	
Number of TV Sets:	7,000,000

INTELSAT REPRESENTATIVE:

Pakistan Telecommunications Corporation

(PTC)
85-West, Rizwan Centre, Blue Area
Islamabad, Pakistan
Mr. B. Ahmad
Deputy Chief Engineer (O/S-II)

Tel: (92) 51-210-528

Fax: (92) 51-819-230

INTELSAT EARTH STATIONS:

DEH MANDRO 1 - 60° E (GENTEL ISLAMABAD)
DEH MANDRO 2 - 359° E (GENTEL)
DEH MANDRO 3 - 60° E (PTC)
MALCHH 1 - 63° E (GENTEL)
UNPAK 1 - 60° E (UNITED NATIONS)

In addition to the above-mentioned international earth stations, Pakistan also has ten domestic earth stations which interface using the INTELSAT satellite at 66 degrees East Longitude.

Home Satellite TV Legal Status: Legal

BROADCAST ORGANIZATIONS:

Pakistan Television Corporation (PTV)

P.O. Box 1221
Constitution Avenue
Islamabad
Pakistan
Tel: (92) 51-822-191
Fax: (92) 51-823-406

SATELLITE EQUIPMENT MANUFACTURERS AND DISTRIBUTORS:

Logitech

6-B, Saeed Hai Rd.
M.A.C.H.S.
PO Box 13024
Karachi 75350 Pakistan
Nooruddin Ahmed, Chief Executive
Akbar Khan Qureshi, Manager
Shamimuddin Ahmed, Dir. Eng.
Ali Zaman Baig, Dir. Marketing
Abun-Nasr Faizi, Project Dir. TV & Satellite
Tel: (92) 21-430-261
Fax: (92) 21-455-9956

Products manufactured: dish antennas and satellite receivers; products distributed: E.F. Johnson Co., Ltd., USA, CATEL Pvt., Ltd. USA, Walter Dittel GmbH, Germany.

Videoshack Systems Ltd.

18-D Industrial Area
Rawalpindi Pakistan
T. Jilani, Mng. Dir.
Mr. Alamgir, Director
Tel: (92) 51-861-955
Fax: (92) 51-862-217

Products manufactured: Astro and Magnasat dish antennas, satellite receivers, feedhorns; products distributed: CATV and MATV systems. Videoshack Ltd. is a wholly independent Pakistani company, designing and manufacturing HighTech products for the local and foreign markets. Clients include Pakistan Television Corp., Defence Forces, Telephone & Telegraph, and importers in Kuwait, UAE, CIS, Nepal, Saudi Arabia, and Bangladesh.

M/S Viva International

2nd Floor Zaman Plaza
The Mall, Lahore, Pakistan
Muhammad Usman, Chief Executive Officer
Muhammed Tariq, Mrk. Mgr.
Muhammad Saleem, Sales Mgr.
Shuja A. Taimuri, Satellite engineer
Tel: (92) 42-723-6311
Fax: (92) 42-722-6311

Products distributed: satellite receivers, LNBs, feedhorns, and accessories; services provided: consulting.

Wavetech (Private) Ltd.

C-31, KDA Scheme No. 1
Karachi 75350 Pakistan
Dr. Altamash Kamal, Mng. Dir.
Tel: (92) 21-447-779, 430-167, 430-168
Fax: (92) 21-454-5465, 241-5632

Products manufactured: Satellite receivers, aluminum and fiberglass parabolic antennas (4 ft. to 20 ft. in diameter), satellite tracking systems, feedhorns, SMATV equipment; products distributed: receivers, LNBs, dishes, motorized systems, SMATV equipment and systems, cable headends, and broadcast equipment; services provided: consulting. Since pioneering satellite television in Pakistan in 1986, Wavetech has grown into the largest satellite company in the country with a customer base that covers five continents with products and services for both the home and the commercial marketplace. Wavetech equipment is used throughout Pakistan for the terrestrial rebroadcast of CNN, and by almost all the leading hotels and commercial establish-

ments. Wavetech has offices, manufacturing and service facilities in Karachi and Lahore, and a dealer network that spans the country. With over fifty qualified engineers and technicians, the company has adequate resources to service and support its equipment. Wavetech's other activities include software development, design and manufacture of industrial control equipment, and technical consulting.

PAPUA NEW GUINEA



Government:	Commonwealth Member (U.K.)
Population:	4,095,000
Gross National Product:	US\$ 3.8 billion (1993 estimate)
Language(s):	English, Melanesian, Papuan
Religion:	Christian
Time Standard:	GMT+10
Currency Standard:	Kina (0.97 = US\$ 1)
Video Standard:	PAL (BG)
Electrical System:	240/415 a.c., 50 Hz.
Telephone Country Code:	(675)
Major City Telephone Codes:	None
Number of TV Sets:	280,000

INTELSAT REPRESENTATIVE:

Post and Telecommunication Corporation

(PTC PORT MORESBY)
International Telecommunications Dept.
P.O. Box 56
Port Moresby, Papua New Guinea
Tel: (675) 274-147
Fax: (675) 213-163

INTELSAT EARTH STATIONS:

LAE 1 - 177° E
PORT MORESBY 1 - 174° E
PORT MORESBY 2 - 174° E

SATELLITE OPERATOR ORGANIZATION:

Pacific Satellite Inc.

1000 Potomac St., NW
Washington, D.C. 20007
Kim Degnan
Tel: (202) 686-9795
Fax: (202) 686-5768

Operator of the proposed Pacstar satellite system

Home Satellite TV Legal Status: Legal

BROADCAST ORGANIZATIONS:

EMTV

P.O. Box 443
Port Moresby
John Taylor, Chief Executive Officer
Brett Daley, Company Secretary
John Clarke, Sales Manager
Tel: (675) 257-322
Fax: (675) 254-450

Terrestrial and satellite broadcaster.

TVRO MANUFACTURERS/DISTRIBUTORS:

HiTron Pty. Ltd.

P.O. Box 9209, Hohola, N.C.D.
Papua New Guinea
Lindsay Jorgensen, Managing Director
Anne Ames, Sales & Marketing
Tel: Port Moresby (675) 25-2311
Fax: Port Moresby (675) 25-0349

Products distributed: TVRO satellites systems, cable TV systems, and MMDS equipment; services provided: supply and installation of satellite TV systems and cable TV systems, and technical consulting. HiTron Pty. Ltd. is the largest installer and operator of TVRO and cable television systems throughout Papua New Guinea.

Las Kompani Pty. Ltd.

P.O. Box 391
Wewak, ESP Papua New Guinea
E. J. Hanson, Director
Tel: (675) 86-2448

PHILIPPINES



Government:	Republic
Population:	68,550,000
Gross National Product:	US\$ 42.75 billion (1993 estimate)
Language(s):	Filipino, English, Cebuano, Bicol, Ilocano, Pampango
Religion:	Catholic
Time Standard:	GMT+8
Currency Standard:	Piso (27.03 = US\$ 1)
Video Standard:	NTSC (M)
Electrical System:	110/220 a.c., 60 Hz.
Telephone Country Code:	(63)
Major City Telephone Codes:	
Manila, Quezon City - 2	
Cebu - 32	
Iloilo - 33	
Bacolod - 34	
Davao - 35	
Batangas - 43	
Zamboanga - 62	
Anges - 455	
General Santos - 8321	
Cagayan de Oro - 8822	

Number of TV Sets: 7,500,000

INTELSAT REPRESENTATIVE:**Philippine Communications Satellite Co.**

(PHILCOMSAT)

11th Fl Telecoms Plaza Building

316 Gil Puyat Ave. 1200

Makati, Metro Manila

Philippines

Mr. Edgardo A. Villanueva

Vice President Operations

Tel: (63) 2-817-9429

Fax: (63) 2-817-4131/9430

MAIN Tel: (63) 2-815-8406

MAIN Fax: (63) 2-817-9430

INTELSAT EARTH STATIONS:

CUBI POINT 2 TVRO - 180° E (POTELCO)

CUBI POINT NAS 1 - 180° E

MANILA 1 - 177° E

PINUGAY 1 - 183° E

PINUGAY 2 - 60° E

PINUGAY 4 - 174° E

PORO 1 - 180° E

PORO 2 - 180° E

C-BAND TRANSPORTABLE**Philippine Communications Satellite Co.**

11th Fl Telecoms Plaza Building

316 Gil Puyat Ave. 1200

Makati, Metro Manila

Philippines

Mr. Arsenio R. Afable, Jr.

Asst. Vice-President Marketing

Tel: (63)2-815-9608

Fax: (63)2-817-9596

REGULATORY ORGANIZATION:**Department of Transportation and Communications**

Philcomcen Bldg., Ortigas Ave.

Pasig, Metro Manila, Philippines

Tel: (63) 2-721-3781

Home Satellite TV Legal Status: Legal

NATIONAL TELECOMMUNICATIONS COMPANY:**Philippine Long Distance Telephone Co.**

Makati General Office PO Box 952 MCC

Legaspi St., Makati, Metro Manila

Philippines

Rufino S. Lanaca, Manager

Cesar G. Reyes, Vice President

Tel: (63) 2-816-8326

Fax (63) 2-815-1599

SATELLITE OPERATOR:**Tongasat**

LPL Center, 22nd Floor

130 Alfaro Street, Salcedo Village

1200 Makati Metro Manila

Philippines

BROADCAST ORGANIZATIONS:**21 World TV/kampana television corporation**

Salvador C. Tan

Strata 200, Emerald Avenue

Ortigas Center

Pasig, Metro Manila

Philippines

GMA Rainbow Satellite

Republic Broadcasting System, Inc.

RBS Building, E. de los Santos Ave.

Corner Timog Ave.

Diliman, Quezon City,

Metro Manila 1103 Philippines

Menardo R. Jimenez, President & CEO

Antonio D. Seva, Officer in Charge,

News & Public Affairs

Juan S. Cruz, Corporate Treasurer

Roberto V. Barreiro, Sr. V.P., Network Ops.

Eng. Emilio S. Solidum, Sr. V.P., Engineering

Tel: (63) 99-70-21 to 24

Radio and television broadcast service. TV program services are available throughout the Philippines via satellite. Select local programs are also seen throughout Southeast Asian countries covered by the Palapa B2P satellite, in Guam via TV-Manila, Hawaii via KIKU-Honolulu, and parts of the U.S. via the International Channel Network.

ABS-CBN - Channel 2

Mother Ignacia St.
Sgt. Esguerra Ave.
Quezon City
Metro Manila
Philippines
Tel: (63) 2-989-838
Fax: (63) 2-922-7954

People's Television Network, Inc. - Channel 4

Broadcast Complex, Visayas Ave.
Quezon City
Metro Manila
Philippines
Lourdes I. Ilustre, Chairman, Board of Directors
Ramy S. Diez, Network, General Mgr.
Luis Lorenzo, Jr., Board of Directors
Maan Hontiveros, Board of Directors
Evelyn David, Board of Directors
Jesus Matubis, Board of Directors
Tel: (63) 2-921-6064, -9112
Fax: (63) 2-921-2344

People's Television Network, Inc. is the government television network of the Philippines.

Asia-Pacific Broadcasting Company, Inc.

5th floor, Sagittarius Condominium
H.V. dela Costa St.
Salcedo Village, Makati
Metro Manila,
Philippines
Rey H. Hulog, General Manager
Tel: (63) 817-4341
Fax: (63) 817-4344

**SATELLITE EQUIPMENT MANUFACTURERS
& DISTRIBUTORS:**

Atronics Manufacturing Corporation

Penthouse, Fortune Office Bldg.
160 Legaspi St. Legaspi Village
Makati, Metro Manila
Philippines
Noemi P. Cerbito, General Manager
Tel: (63) 2-862-616
Fax: (63) 2-817-9947

C.E.B.I. Electronics Corporation

P.O. Box 7320 DAPO
Pasay City, Metro Manila 1300
Philippines
Ernie L. Claudio, President
Menardo G. Jiminez, Vice President
Roberto D. Deocareza, Eng. Ops. Mgr.
Nylon B. Bunag, field supervisor
Tel: (63) 2-532-7283
Fax: (63) 2-866-528

Technical consulting for Broadcast & Communication.

CYO International

Suite 501/503 Greenhills Mansion
No. 37 Annapolis St.
Greenhills, San Juan,
Metro Manila,
Philippines
Raphael A. Santiago, Director of Eng.
Tel: (63) 2-721-8190
Fax: (63) 2-721-2386

Datalink Radio Corp.

1680 E. Rodriguez Sr. Ave.
Quezon,
Philippines

International Communications Corporation

(ICC Telecoms)
5/F, Benpres Building
Meralco Avenue
Corner Exchange Rd.
Pasig 1600
Metro Manila,
Philippines
Randolph C. Suguitan
Ass. V.P., Network Ops.
Tel: (63) 2-633-6786
Fax: (63) 2-632-1230

Macrotel Systems, Inc.

Suite 303 Oledan Bldg.
131 Ayala Avenue
Makati, Metro Manila
1200
Philippines
Felipe S Magallon, President
Tel: (63) 2-817-2647, 817-3507
Fax: (63) 2-817-2663

Contrex Trade Exponent

6th Floor, Strata 100 Building
 Ortigas Centre, Pasig,
 Metro Manila,
 Philippines
 Ed S. Pineda
 Tel: (63) 2-632-9037
 Fax: (63) 2-631-3258

Fil Products, Inc.

810 Tres De Abril
 Lababgon, Cebu City
 Philippines
 Nonito A. Limchua, President
 Diana D. Limchua, Vice President, Finance
 Venancio Pamindim, Vice President, Technical
 Herman Flaviano, Technical Consultant
 Tel: 72137

Products manufactured: TV transmitter, FM Transmitter, TV translator, CATV amplifiers; products distributed: cable amplifiers, taps, splitters, power supplies, and other CATV related equipment; services provided: engage in the supply of Cable TV materials/equipment installation of TV transmitters, TV coverage via station to transmitter link (STL).

L & S Cable Television

308 San Rogue St.
 Pasay City
 Philippines
 Eng. Leon P. Sebastian, General Mgr.
 Dr. Felixberto C. Sarmiento, Vice President
 Raymundo P. Sebastian, Head, Operations
 Tel: 815-0171

Cable television services distribution.

Megawatt Construction Corp.

2-D Villalen Bldg., Jones Ave.
 Cebu City, 6000
 Philippines
 Wilson L. Chua, Managing Director
 Jason Joule Antonio Troye, O.P.s. Mgr.
 Dennis C. Baber, Budget Mgr.
 Michael A. Chieng, Ad. Mgr.
 Tel: (63) 32-210-486
 Fax: (63) 32-210-398

Electrical contracting.

Multicable Entertainment Inc.

250 A.S. Fortuna St.
 Bakilid, Mandaua City
 6014 Philippines
 Angelo Verdan, President & CEO
 Robin Ong, Chairman of the Board
 Mario de la Victoria, V.P., Ops.
 Mayen Angbetic Tan, V.P., Sales & Programming
 Tel: (63) 32-85042
 Fax: (63) 32-460-923

Cable TV services & distribution

Orange Coast Datacom Manila, Inc.

Suite 410A Catteye Condominium
 235 Salcedo Street, Legaspi Village
 Makati, Metro Manila 1200
 Philippines
 Roy Noel Asi, President
 Tel: (63) 2-813-5460
 Fax: (63) 2-818-7592

Sky Cable Central CATV Inc.

Exchange Road/ Meralco Ave.
 Benpress Bldg., Pasig
 Metro Manila,
 Philippines
 Mel Velarde, General Mgr.
 Eng. Fernando Morales, Senior V.P. - Engineering
 Ernesto Enriquez, V.P. - Finance
 Eng. J.R. Umipig, V.P., Engineering
 Tel: 632-9788
 Fax: 632-9796
 Cable Television service.

United Satellite & Radio Systems

257 Quirino Ave., Tambo
 Paranaque, Metro Manila
 Philippines
 J.M. Dabao, Proprietor
 R.S. de la Victoria, Manager
 Tel: (63) 2-831-2676
 Fax: (63) 2-831-2676

Products manufactured: Satellite dish antennas 12 to 40 ft. in diameter, C-Band mesh or 6-20 ft. solid fiberglass; products distributed: MTILNBs, headend and MMDS, TVRO receivers by Benjamin Electronics Co. Ltd., SMATV headends by Pace Micro Technology; services provided: Satellite TVRO, SMATV, CATV installations & technical consulting.

Waters Unlimited Inc.

No. 5 Jose Wright St.

San Juan

Metro Manila, Philippines

Richard C. Yu, General Manager

Tel: 632-788-416

Fax: 632-722-6324

MAIN Tel: (974) 400-455

MAIN Fax: (974) 497-4007

INTELSAT EARTH STATIONS:

DOHA 1 - 60° E (MINISTRY OF TEL.)

DOHA 2 - 342° E (MINISTRY OF TEL.)

QATAR

Government: Emirate
 Population: 574,000
 Gross National Product: US\$ 3.4 billion
 (1993 estimate)
 Language(s): Arabic, Farsi, Urdu
 Religion: Muslim
 Time Standard: GMT+3
 Currency Standard: Qatar Riyal
 (3.64 = US\$ 1)
 Video Standard: PAL
 Electrical System: 220 a.c., 50 Hz.
 Telephone Country Code: (974)
 Major City Telephone Codes: None

INTELSAT REPRESENTATIVE:**Qatar Public Telecommunications Corp.**

(Q-TEL)

P.O. Box 217

Doha, Qatar

Eng. Abdulwahad Fakhroo

Manager Freq. Management

International & Public Relations

Tel: (974) 424-840

Fax: (974) 414-514

RUSSIA

Government: Republic
 (CIS member state)
 Population: 149,500,000
 Gross National Product: US\$ 907.2 billion
 (1993 Estimate)
 Language(s): Russian
 Religion: Orthodox Christian,
 Muslim minority
 Time Standard: GMT+3 Moscow
 GMT+4 Nizhi,
 Novograd
 GMT+5 Chelyabinsk
 GMT+6 Omsk
 GMT+7 Krasnoyarsk
 GMT+8 Irkutsk
 GMT+10
 Khabarovsk
 GMT+12
 Petropavlovsk-
 Kamchatka
 Currency Standard: Rouble
 (1.65 = US\$ 1)
 Video Standard: SECAM
 Electrical System: 127/220 a.c., 50 Hz.
 Telephone Country Code: (7)

INTELSAT REPRESENTATIVE:**Russian Satellite Communication Company**

37 Shabolovka Street

113162 Moscow

Russia

Mr. Yuri Kiyashev, General Director

Tel: (7) 95-952-85-50

Fax: (7) 95-955-83-28

MAIN Tel: (7) 95-232-3184

MAIN Fax: (7) 95-230-2097

INTELSAT EARTH STATIONS:

DUBNA 1 - 335.5° E

KHABAROVSK 1 - 174° E

KHABAROVSK 2 - 177° E



(DAL TELECOM INTL)
 MOSCOW - 342° E
 SAKHALIN 1 - 177° E
 SAKHALIN 2 - 177° E
 SAKHALIN 3 - 177° E
 (KRILJCN)
 SAKHALIN 4 - 174° E
 (INTERTELCOM)
 SVIAZ 1 - 335.5° E
 (BUSINESS SVIAZ)
 SVIAZ 2 - 60° E
 (BUSINESS SVIAZ)
 SVIAZ 3 - 60° E
 (BUSINESS SVIAZ)
 SVIAZ 4 - 60° E
 (BUSINESS SVIAZ)
 TASS-1 - 332.5° E (TASS)
 TASS-2 - 63° E (TASS)
 TATARSTAN - 359° E
 (TATINCOM)
 VLADIVOSTOK 1 - 177° E
 (INTERDALTELCOM)

Also Ku-band Transportable Uplinks

INTERSPUTNIK EARTH STATION:

DUBNA-1 - 14° W
 VLADIMIR-1 - 80° E

BROADCAST ORGANIZATIONS:

Russia TV 1 & 2

12, Corolyov Str.
 RUS-127000 Moscow
 Russia
 Tel: (7) 95-217-7898
 Fax: (7) 95-288-9508

World Television News (WTN)

c/o Interevm
 Presnenski Val 19
 Room 513
 123557 Moscow
 Russia
 Tel: (7) 95-254-4758, 255-0278
 Fax: (7) 95-256-6228

INTERNATIONAL SATELLITE ORGANIZATIONS:

Global Information Systems, Inc.

GDVIC VVC Prospect Mira
 129223, Moscow,
 Russia
 Vladimir A. Andriyanov, President
 Valeri I. Koutoukov, Marketing Manager
 Tel: (7) 95-181-4209
 Int. Tel/Fax: (7) 502-221-5008

Operator and Marketing Agent for the proposed
 GloboStar Satellite System using Russian "Koupon"
 satellites beginning in 1994.

Intersputnik

2nd Smolensky Lane, 1/4
Moscow, 121099
Russia
Tel: (7) 95-244-03-33
Fax: (7) 95-253-9906

International consortium which operates via the Russian STATIONAR satellite system.

SATELLITE SALES & MARKETING:

Glavcosmos

Krasnoproletarskaya St. 9
Moscow 103030
Russia
Tel: (7) 95-258-2220

Markets Russian satellites and launchers internationally.

SATELLITE MANUFACTURER:

NPO

Krasnoyarsk-26
660026
Russia
Tel: (7) 83-912-5661

SATELLITE EQUIPMENT MANUFACTURERS:

Moscow Microwaves (MMW)

P.O. Box 137
Moscow 121108
Russia
Tel: (7) 95-146-0595
Fax: (7) 95-197-1478

Manufacturer of C-band LNBs, Feedhorns, Russian C-band satellite TV Receivers, and other microwave special applications products.

Rodnik Software, Ltd.

1 Nakhimovsky Avenue, Bldg. 1
Moscow 113556
Russia
Yuri A.. Kovalov, Project Manager
Tel: (7) 95-113-2688
Fax: (7) 95-915-0485

Manufacturer and developer of "Satcom" satellite computer software.

Rusant

Moscow, 3-ya Tverskaya-Yamskaya
D. 46
Russia
Mikhail Bogdanov, Ph.D., V.P.
Tel: (7) 95-250-1693
Fax: (7) 95-972-4632

Products manufactured: a complete line of Ku-band flat plate satellite antennas.

TVRO Teleset Service

P.O. Box 055,
Moscow 105483
Russia
Tel: (7) 95-166-2674
Fax: (7) 95-166-1436

SATELLITE SERVICE PROVIDERS:

BELCOM MOSCOW

Usacheva 35
Moscow 119048
Russia
Kenny Schaeffer
Tel: (7) 95-245-5402
Fax: (7) 95-245-5766

Russian Communications Satellites

Russia's Statsionar (Stationary) domestic satellite network uses many different classes of telecommunications spacecraft, each with distinct capabilities. These are the Gorizont (Horizon), Raduga (Rainbow), SDRN/Loutch (Ray), Molniya (Lightning), Potok (Geizer), and Ekran (Screen) satellites. Beginning in 1994, several new classes of Russian satellites are scheduled to be launched, including Express, Koupon, Gals, and SOVCAN Star.

Gorizont Satellites

The Gorizont class satellites are three-axis stabilized spacecraft which carry global, semi-global (Northern hemispheric), zone, and spot beams. The Gorizont communications payload consists of six C-band transponders, one Ku-band transponder, and one L-band transponder. The C-band payload can serve multiple needs, such as the transmission of TV signals, wide and narrow range telephony, radio programs, and facsimile. A cross-link between the 1.6/1.5 GHz range transponder and one 6/4 GHz transponder is provided so that the satellite can relay traffic between ships at sea and coast earth stations.

Gorizont EIRP levels range from a minimum of 28 dBW at the boresight of the C-band global beam to a staggering 46 dBW at the boresight of Gorizont's high-powered spot beam. Networks with extensive ground-based facilities access the more powerful zone and spot beam transmissions, while networks with relatively few ground terminals use the semi-global and global beams.

All Gorizont satellites operate in an inclined orbit mode, which requires that ground stations track the movements of the satellite. The initial orbital inclination usually equals ± 0.8 degrees. Due to gravitational influences over time, the satellite's

inclination will increase to more than ± 2.0 degrees by the end of the third year in orbit.

Russian TV Distribution. Due to its size, the vast area encompassing the Commonwealth of Independent States (CIS) spans ten time zones. Six Gorizont satellites are used to send time-delayed versions of Moscow's I Orbita and Dub'l TV services into distinct districts within the CIS. Two of the six satellite locations—Statsionar 6 at 90 degrees East Longitude and Statsionar 7 at 140 degrees East Longitude—transmit both Moscow TV services. Six other orbital locations—Statsionar 4 at 14 degrees West Longitude, Statsionar 11 at 11 degrees West Longitude, Statsionar 13 at 80 degrees East Longitude, Statsionar 5 at 53 degrees East Longitude, Statsionar 14 at 96.5 degrees East Longitude, and Statsionar 21 at 103 degrees East Longitude—use high-powered spot beams to relay one of the two services to thousands of 2.5 meter "Moskva" earth stations linked to untended VHF TV transmitters.

Overseas TV Distribution. The Indian Ocean Statsionar 12 satellite located at 40 degrees East Longitude relays RTP International and TV5 France to cable and SMATV systems in Africa and the Middle East. Other Indian Ocean Gorizont satellites carry numerous regional and national TV services, including the Asian Television Network (ATN)—an English/Hindi program service developed by a consortium of Indian expatriates living in London; TV/Radio Azerbaijan, Muslim TV Ahmadiyya, TV Viet Nam, and CCTV-4—China's overseas television service.

On April 1, 1990, Ku-band transponders carried by Gorizont satellites located at the Statsionar 4 and Statsionar 5 orbital positions began relaying backhaul services for commercial customers such as Reuters TV,

WTN, and the European Broadcasting Union (EBU) from any point in Europe. Customers with Ku-band transportable earth stations can link virtually any European location with their overseas studios by using Moscow as the relay point for routing telecommunication traffic.

The Intersputnik Satellite Cooperative.

Intersputnik is an international satellite cooperative formed in November of 1971 when eight nations signed the Agreement on the Establishment of the Organization. There are sixteen member nations: Afghanistan, Bulgaria, The Commonwealth of Independent States (CIS), Cuba, the Czech and Slovak Republics, Gabon, Germany, Hungary, the Korean People's Democratic Republic, Laos, Mongolia, Poland, Rumania, the Socialist Republic of Vietnam, and the Republic of Yemen. Moreover, non-signatories such as Algeria, Cambodia, Iraq, Libya, and Syria sometimes use the Intersputnik network for communications with Intersputnik member states.

The Intersputnik system leases transponder capacity on two Russian satellites located at the Statsionar 4 orbital location at 14 degrees West Longitude and Statsionar 13 orbital location at 80 degrees East Longitude. Intersputnik traffic includes video, voice, and data.

Twelve earth stations located in Algeria, Bulgaria, Cuba, the Czech Republic, Germany, Ghana, Hungary, Iraq, Nicaragua, Yemen, Poland, and the Commonwealth of Independent States (CIS) use the Atlantic Ocean Statsionar 4 satellite. Seven earth stations located in Afghanistan, Laos, Mongolia, the Commonwealth of Independent States (CIS), Vietnam (two stations), and Cambodia use the Indian Ocean Statsionar 13 satellite.

Because of their locations, some Intersputnik member nations cannot use

the same Statsionar satellite to communicate directly with one another. In this case, they use an earth station located within a central zone where beams from the Statsionar 4 and Statsionar 13 satellites overlap. This earth station may relay programs from one satellite to the other, or may interface with ground-based communications facilities to deliver traffic from one country to another.

Russian STATIONAR Satellite Orbital Positions

Name	Occupant	Location
Statsionar 1	_____	1° E
Statsionar 2	Raduga 28	35° E
Statsionar 3	Raduga 30	85° E
Statsionar 4	Gorizont 20	14° W
Statsionar 5	Gorizont 27	53° E
Statsionar 6	Gorizont 28	90° E
Statsionar 7	Gorizont 18	140° E
Statsionar 8	Raduga 23	25° W
Statsionar 9	Raduga 24	45° E
Statsionar 10	Raduga 18	170° W
Statsionar 11	Gorizont 26	11° W
Statsionar 12	Gorizont 22	40° E
Statsionar 13	Gorizont 24	80° E
Statsionar 14	Gorizont 19	95° E
Statsionar 15	Raduga 27	128° E
Statsionar 16	_____	145° E
Statsionar 17	_____	26.5° W
Statsionar 18	_____	8° E
Statsionar 19	_____	23° E
Statsionar 20	Raduga 25	70° E
Statsionar 21	Gorizont 25	103° E
Statsionar 22	_____	_____
Statsionar 23	_____	15° E
Statsionar 24	Raduga 1-2	49° E
Statsionar 25	_____	37.5° W
Statsionar 26	_____	155° W
Statsionar 27	Raduga 29	12° E
Statsionar "T"	Ekran 18	99° E
_____	Raduga 26	73° E
_____	Gorizont 29	130° E

The Raduga Satellites

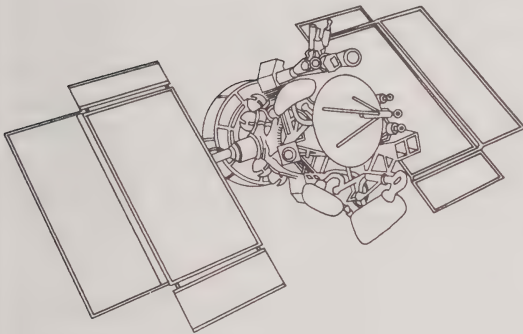
On December 22, 1975, the former Soviet Union launched its first dedicated geostationary communications satellite. This "Raduga" satellite was assigned to an or-



**Gorizont global beam coverage
(Pacific Ocean Region)**



**Gorizont northern hemispheric beam coverage
(Pacific Ocean Region)**



**Gorizont zone beam coverage
(Indian Ocean Region)**

Gorizont global, hemispheric, zone and spot beam coverages.

bital position of 85 degrees East Longitude. Since 1975, more than thirty Raduga spacecraft have been deployed at orbital assignments of 35, 40, 45, 49, 85, and 128 degrees East Longitude, and 25 and 170 degrees West Longitude. The basic design of Raduga is an earlier version of the Gorizont three-axis stabilized platform. English translations of Russian space journals have made basic references to the Raduga three-

axis stabilized platform, but little else is known in the Western world about the technical parameters of this spacecraft.

The first Raduga spacecraft were used for broadcasting time-delayed versions of two Russian central television channels and the Mayak (Beacon) radio network to more than forty-four Orbita stations throughout Russia and the Commonwealth of Independent States (CIS). In recent years, these

Russian broadcast services have been shifted to high-powered spot beams on Gorizont satellites.

Five C-band transponders on the Raduga satellites downlink using the 3.4 to 3.65 GHz frequency range. These channels almost exclusively relay message traffic between isolated areas in the Commonwealth of Independent States. Raduga spacecraft transmit the matrixes of Moscow-based newspapers to remote printing facilities in the city of Khabarovsk. These transmissions provide Russian citizens in the Far East with same-day access to these newspapers.

Ekran Satellites

"Ekran" satellites operate at UHF frequencies allocated by the 1971 World Administrative Radio Conference (WARC-71) for direct broadcast satellites. Each Ekran satellite carries a transponder for transmitting one TV signal and two radio signals to community antenna TV (CATV) systems and private residences in rural Siberia. A time-delayed version of I Programma transmits for 12 to 16 hours a day on the Ekran satellite at 99 degrees East Longitude. The Ekran satellite uses a 200 watt Klystron tube amplifier to produce a signal level of 56.5 dBW.

Molniya Satellites

"Molniya" (Lightning) satellites beam communications signals to almost any location on Earth North of the Equator. Instead of maintaining a geostationary position, Molniya satellites travel along an elliptical orbit. This orbit takes them from one apogee over the Commonwealth of Independent States to a perigee near Antarctica, and then back up to a second apogee approximately 20,000 miles over Hudson Bay, Canada. Molniya satellites inhabit each apogee for about six hours a day, during

which they maintain relatively stable positions. Molniya satellites at apogee over Hudson Bay relay communications signals across the North Pole to the Northernmost regions of the continent. Because of their eccentric orbits, Molniya satellites at apogee also cover North America.

Prior to 1991, Molniya was used to broadcast a single channel of TV programming to locations in the Northern portion of the continent. Signal spill-over into North America allowed many colleges and universities to receive Russian television through dedicated Molniya tracking systems. On January 2, 1991, Russia discontinued use of Molniya for the transmission of TV programming.

Outside its one hour at apogee, each Molniya satellite must be tracked at intervals of 10 to 15 minutes. At the end of the six-hour period, the satellite's transponders are turned off as the gravitational field of the Earth accelerates the bird along its pendulum-like orbit, carrying the satellite rapidly out of North American skies.

SDRN and Loutch

Russia originally established its Satellite Data Relay Network (SDRN) as an Eastern Counterpart to NASA's Tracking and Data Relay Satellite System (TDRSS). The SDRN system, which consists of three satellites placed at strategic locations over the Atlantic, Pacific and Indian Ocean Regions (16 and 160 degrees West Longitude and 95 degrees East Longitude), was originally designed to provide a vital link between the Mir space station and ground command facilities of the Russian Space Agency.

As initially envisioned, the Soviet Union designed a Loutch ("Ray") Ku-band satellite system that would initially consist of multiple ten-transponder satellites located at 14 degrees West and 53, 90, and 140 degrees East Longitude. While a dedicated

Loutch satellite was never placed into orbit, a single Ku-band Loutch-style Ku-band transponder (11.525 GHz) was built into several Gorizont satellite platforms. This Ku-band capacity is today in use at the Statsionar orbital positions of 11 and 14 degrees West Longitude, and 40, 53, 80, and 140 degrees East Longitude.

The practice of having a limited commercial Ku-band payload ride "piggyback" on a separate satellite platform has continued with the launch of the SDRN satellites. Last year, the Russians began marketing capacity on the SDRN satellites to prospective Western clients. As part of their marketing efforts, the Russians redesignated the SDRN orbital positions of 16 degrees West Longitude, 95 degrees East Longitude, and 160 degrees West Longitude as Loutch 2, Loutch 1, and Loutch 3.

In 1992, the United States filed a coordination request with INTELSAT to allow the U.S. and Russia to use the Loutch 2 payload at 16° West for telephony transmissions between Moscow and the United States. Capacity on Loutch 1 and Loutch 3, which is still available, represents an in-orbit resource for prospective clients in the Asia/Pacific Region.

The Loutch/SDRN combined satellite payload consists of three transponders: a TV/data transponder operating in the 15/13 GHz (LH-14.591~14.625 GHz uplink/RH-13.511~13.545 downlink) range with a 0.5 degree steerable spot beam that provides a peak EIRP of 55.2 dBW, a telephone communication transponder operating in the 0.9/0.7 GHz uplink downlink spectrum with a 6 degree spot beam that delivers a peak EIRP of 40.7 dBW, and a commercial communications transponder operating in the 14/11 GHz (LH-15.130~15.180 GHz uplink/RH-10.810~10.860 GHz downlink) spectrum with a 1 degree steerable spot beam that offers a peak EIRP of 42.3 dBW.

Other Loutch/SDRN payload characteristics include a mass of 2,400kg, overall dimensions of 8.5m x 11m x 16m, a five-year mission lifetime, 1800 watts of electrical power and a stationkeeping accuracy of ± 0.5 degrees.

Potok (Geizer) Satellites

During the early 1980s, the Russians filed with the ITU's International Frequency Registration Board for a new C-band "Potok" satellite system at three orbital positions (13.5 degrees West Longitude, 80 degrees East Longitude, and 168 degrees West Longitude). Within the past few years, two "Geizer" class satellites have been launched to Potok orbital positions over the Atlantic and Pacific Oceans.

In 1992, INTELSAT approved a consultation request initiated by Comsat Corporation concerning the use of a Russian Geizer C-band communications satellite located at 13.5 degrees West Longitude for the provision of international telephony between the United States, the Russian Federal, and European countries which are not members of INTELSAT. The Geizer satellite payload consists of a single C-band transponder. Today this capacity, which is interconnected to the public switched network, carries up to one hundred 64 kb/s equivalent telephone circuits. According to Comsat, the Geizer satellite system previously served as part of the former Soviet Union's nuclear missile communications system.

Geizer is equipped with two phased array antennas connected to a telecommunications payload equivalent to two 36-MHz-wide transponders. Because the Geizer satellite operates in frequency bands which do not overlap the frequency bands used in the INTELSAT system, INTELSAT concluded that the use of Geizer by the United States and Russia was technically compatible with

the INTELSAT system.

Future Russian Satellite Classes

Express Satellites

Beginning in 1994, the Russians will begin launching a new series of dual-band satellites known as "Express". Based on the tried and true Gorizont spacecraft bus (twenty-seven flight models already placed in orbit) Express will offer additional capacity, a longer mission lifetime (five to seven years versus three years for Gorizont spacecraft), and superior stationkeeping.

Express satellites will carry ten C-band (Trs. 6 to 11, 13 to 17) and two Ku-band (Trs. 12 & 20) transponders versus the six C-band and one Ku-band transponders provided by existing Gorizont class satellites. The published literature on Express does not indicate whether the additional transponders will use new frequencies above existing Gorizont transponders or frequency reuse through the introduction of dual senses of circular polarization. All Express satellites will feature extensive in-orbit steerability of its spot beams. Gorizont satellites only allow for a one-time adjustment of beam pointing in orbit. (Further information on Express satellites appears in chapter 7.)

Russia intends to begin launching Express satellites to 11 and 14 degrees West Longitude, and 40, 53, 80, 90, 96.5, 103, and 140 degrees East Longitude. Moreover, the Russians have agreed to supply Rimsat with multiple Express satellites for a Pacific Ocean Region satellite system and supply SovCanStar joint venture between Russian and Canadian companies with an Express satellite at 145 degrees East Longitude. INTELSAT also has acquired one Express satellite and holds options to acquire several additional Express satellites for its Asian Landmass satellite cluster at 69, 85,

91.5, and 95 degrees East Longitude.

Gals Satellites

"Gals" (Tack) satellites are medium-powered DBS spacecraft with full North/South stationkeeping abilities and a bigger communications package than existing Russian spacecraft. The launch of the first Gals satellite will mark the entry of that country's first truly geostationary bird. The more stable orbit offered by Gals will make it possible for the Commonwealth of Independent States to broadcast programming on behalf of member states.

The Gals satellites will weigh 2,500kg (5,500 lb) each and will have an orbital lifetime of five to seven years. The satellites will be launched by Russia's Proton booster, and will carry three Ku-band transponders for broadcasting.

The new satellites will make services available for business applications, apartment complexes and individual use. Office buildings could use a dish 2.5m (8.25 ft) to provide television services, a 1.5m (5 ft) antenna could provide television to an apartment building, and a Gals dish between .6 and .9m (2 & 3 ft) would make individual use possible.

Koupon Satellites

In December of 1992, Moscow-based Global Information Systems (GIS) unveiled a new series of Ku-band "Koupon" satellites to attendees of the Asia/Pacific Cable and Satellite Summit in Hong Kong. With an antenna platform based on the phased array design previously inaugurated by Geizer, the Koupon satellites would provide multiple transponder capacity from a minimum of three orbital positions over the Atlantic, Indian and Pacific Oceans. The first Koupon satellite launch is scheduled for January of 1994. Koupon-1 will be located at 55° East.

GIS, a private limited company established in Russia in 1991, comprises a number of shareholders including the Association of Independent Banks of Russia, Sovfintrade, and several spacecraft and electronic designers and manufacturers. Leading manufacturer Lavochkin Association designed and built the world's first spacecraft to land on the Moon, Mars, and Venus, as well as various other scientific space probes.

Each Koupon satellite will uplink in the 14.02~14.5 GHz and downlink in the 10.96~11.2 and 11.46~11.7 GHz bands. Beamwidth can be adjusted from 2 x 2 degrees (1500km) to 3.5 x 3.5 degrees (3000km) in 0.5 degrees steps. EIRP can be altered between any one beam in the group of four beams. Koupon-1 will carry sixteen 36-MHz-wide Ku-band transponders, each with its own pair of independent receive and transmit spot beams. Future Koupon satellites may incorporate both C-band and Ku-band transponder payloads. According to recent reports, five Koupon satellites have been ordered and three Koupon spacecraft already are under construction.

Through the use of the phased array antenna payload, each Koupon satellite uplink and downlink beam can be independently and electronically steered to point at any location visible from the satellite's orbital location, with beam steering controlled by commands initiated by the Master Control Earth Station. Moreover, the size and contour power levels (36 to 50 dBW) for each beam can be independently set to correspond to the unique requirements of each customer—a first of its kind in the commercial satellite arena. Best of all, Koupon satellites will be equipped with an on-board high-speed switching matrix that will enable telecommunications traffic to be relayed between any beams offered by the satellite—a feature that provides excep-

tional flexibility for VSAT networks compared to conventional communication satellite payloads.

The primary function of the Koupon satellite system will be to supply a VSAT communications network to banks based in Russia and other CIS countries. The "Bankir Network" will provide a communications infrastructure for the Russian banking and financial system and serve as an interface with foreign banks. The Central Bank of Russia is supporting the entire program and has guaranteed the required financing for the project. Excess capacity on the system will be offered to potential foreign clients by GloboStar, an international marketing company established for this purpose. A second company called GloboNet will market VSAT networks for developing countries and multinational organizations using Bankir system hardware and GloboStar satellite capacity.

SOVCAN Star Satellites

The SOVCAN Star satellite system is the result of a joint venture between the Russian NPO PM manufacturing association and four Canadian corporations: COMDEV, CANCOM, SPAR Aerospace, and General Discovery Canada. SOVCAN eventually intends to provide telecommunications through a series of five SOVCAN Star satellites. Plans call for the first two SOVCAN birds to be launched to orbital positions at the extreme Eastern and Western edges of the Commonwealth of Independent States, connecting the CIS with Eastern and Central Europe on one side, and with the Pacific Rim on the other. Three additional spacecraft at orbital locations in between will handle Russia's internal telecommunications traffic. SOVCAN partner SPAR Aerospace and NPO-PM would be jointly responsible for constructing the twenty-four transponder C-band satellites.

SAUDI ARABIA



Government: Monarchy
 Population: 19,400,000
 Gross National Product: US\$ 86 billion
 (1993 estimate)
 Language(s): Arabic
 Religion: Muslim
 Time Standard: GMT+3
 Currency Standard: Saudi Arabian riyal
 (3.75 = US\$ 1)
 Video Standard: SECAM
 Electrical System: 127/220 a.c., 50 Hz.
 Telephone Country Code: (966)
 Major City Telephone Codes:
 Riyadh - 1
 Jeddah, Mecca, Taif - 2
 Dammam, Hufuf - 3
 Mдина, Tabuk - 4
 Buraydah - 6
 Al-Mubarraz, Khamis-Mushait, Abha - 7

INTELSAT REPRESENTATIVE:

Saudi Telecom, Ministry of PTT
 Saudi Telecom HQ R M No. 107
 Post Box No. 6350
 Riyadh 11132 Saudi Arabia
 Mr. Saad S. Alqousi
 Assistant Director, Operations International
 Tel: (966) 1-454-7930
 Fax: (966) 1-454-2704
 MAIN Tel: (966) 1-454-7817
 MAIN Fax: (966) 1-454-7246

INTELSAT EARTH STATIONS:

JEDDAH 4 - 359° E
 JEDDAH 5 - 63° E
 RIYADH 1 - 60° E
 RIYADH 4 - 342° E
 TAIF - 335.5° E

BROADCAST ORGANIZATIONS:

Saudi Arabian Television

(Government Operated)
 P.O. box 570
 Riyadh, Saudi Arabia

SATELLITE OPERATOR:

Arab Satellite Communications Organization

(ARABSAT)
 P.O. Box 1038
 Riyadh, 11431, Saudi Arabia
 Tel: 464666

SATELLITE COMPANIES:

Alfassel Est.

P.O. Box 13175 Jeddah 21493
 Saudi Arabia
 Jamal H. Al-Salami
 Tel: 665-0268
 Fax: 665-0298

Al-shair Trading Est.

P.O. Box 5696
 Jeddah 21432
 Saudi Arabia
 Mohamad Othman Al-shair
 Tel: (966) 2-648-2578
 Fax: (966) 2-647-6975

Hello Riyadh

P.O. Box 87197
 Riyadh 11642
 Saudi Arabia
 Ron Lins, Operations Director
 Tel: 462-8778
 Fax: 462-8896

Kaido Trading

Nazer Centre Hye-Al-Rohda
 No. 13, P.O. Box 13821
 Jeddah 21414, Saudi Arabia
 Salman M.Z. Al-Sulaiman

Mawarid Electronics Ltd.

P.O. Box 60465
 Riyadh 11545
 Saudi Arabia
 Robert Hill, Project Coordinator
 Tel: (966) 1-465-6538
 Fax: (966) 1-465-6538

Shamalat International Co.

P.O. Box 17076
 Riyadh 11484
 Saudi Arabia
 Saad M. Al-Arif
 Tel: 435-8839
 Fax: 435-2348

SINGAPORE

Government:	Republic (Commonwealth member, U.K.)
Population:	2,828,000
Language(s):	Chinese, Malay, Tamil, and English
Religion:	Buddhist, Christian, Muslim, Taoist, Hindu
Time Standard:	GMT+8
Currency Standard:	Singapore \$ (1.59 = US\$ 1)
Video Standard:	PAL (B)
Electrical System:	230/400 a.c., 50 Hz.
Telephone Country Code:	(65)
Major City Telephone Codes:	None
Number of TV Sets:	565,000

INTELSAT REPRESENTATIVE:**Singapore Telecommunications Pte Ltd**

Comcentre, 31 Exter Road
 Singapore 0923
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 Business Sales Division
 Tel: (65) 730-808
 Fax: (65) 733-8191
 Mr. Tay Chek Khoon, Department Manager
 Operations Representative
 Tel: (65) 460-9200
 Fax: (65) 467-2061

INTELSAT EARTH STATIONS:

AGENCE FRANCE PRESS - 63° E
 BUKIT TIMAH 1 - 60° E
 BUKIT TIMAH 2 - 174° E
 SBC 1 TVRO - 60° E
 SBC 2 TVRO - 174° E
 SENTOSA 1 - 63° E
 SENTOSA 2 - 177° E
 SENTOSA 5 - 63° E
 VSAT 1 - 63° E
 VSAT 2 - 63° E

INMARSAT OPERATOR:**Telecom Authority of Singapore**

4-8 George Street
 City Exchange #04-00
 Singapore 0104
 Tel: (65) 538-0613
 Fax: (65) 538-0402

Telecom Authority of Singapore

International Mobile Division
 71 Robinson Road
 05-00 Crosby House
 Singapore 0106
 Tel: (65) 322-7817
 Fax: (65) 227-9947
 POR - Sentosa

INTERNATIONAL SATELLITE OPERATOR:**Unicom Satellite Corporation**

Level 36, Hong Leong Bldg.
 16 Raffles Quay
 Singapore 0104
 Trevor G. Collins, Director, Asia
 Tel: (65) 321-8939
 Fax: (65) 225-9060

AERONAUTICAL SATELLITE OPERATOR:**SITA**

11 Layang Way
 Singapore 1750
 Joseph S. W. Yam,
 Operations Controller - Far East/Pacific
 Tel: (65) 545-3711
 Fax: (65) 540-7584

NATIONAL TELECOM ORGANIZATION:

Singapore Telecom

15 Hill Street #02-00

Telephone Hill

Singapore 0617

K. S. Sivam, Senior Mkt. Exec.

Tel: (65) 331-6724

Fax: (65) 336-2477

Singapore Telecom

31 Exeter Rd., #20-00, Comcentre

Singapore 0923

Ho Siaw Hong, Project Manager

Satellite Systems Department

Lim Wee Seng, Deputy Mgr,

Satellite Systems

Tel: (65) 838-2669

Fax: (65) 734-8119

Home Satellite TV Legal Status: Not Legal

BROADCAST ORGANIZATIONS:

SBC Enterprises Pte Ltd.

51 Newton Road #23-01712

Goldhill Plaza

1130 Singapore

Mr. Lee Cheok Yew, CEO

Mr. Anthony Ng, V.P. (TV Airtime)

Mr. Michael Chiang, Senior V.P. (Publications)

Mrs. Lee Sik Hui, Senior V.P. (Caldecott Pro. Int.)

Mr. Dominic Chan, V.P. (Caldecott Dist.)

Tel: (65) 255-6288

Fax: (65) 256-8922

Services provided: Marketing of TV airtime and magazine ad space. Production of TV commercials and sales and distribution of SBC programs.

Singapore Broadcasting Corporation

Caldecott Hill

Andrew Road

Singapore 1129

Mr. Moses Lee, General Mgr.

Mr. Lee Cheok Yew, AGM (Ent. Prod.)

Mr. Lim Eng Hai, AGM (Eng. Serv.)

Mr. Larry Lakoduk, Consultant (Radio)

Mr. Param Ajeet Singh Bal, AGM (Admin.)

Tel: (65) 256-0401

Fax: (65) 253-8808

Services provided: TV/radio broadcaster and programme production.

Singapore CableVision Pte. Ltd.

49 Jalan Pemimpin, #02-12 APS Building

Singapore 2057

Tel: (65) 258-0722

Fax: (65) 259-0207

HBO Asia

151 Lorong Chuan Bldg

New Tech Park

Unit #04-05

Singapore 1955

Tel: (65) 287-2210

Fax: (65) 381-1741

Turner Broadcasting Far East Ltd.

3 Jalan Chengam

Singapore 2057

S.C. Leong, General Manager

Tel: (65) 457-0710

Fax: (65) 455-6593

SATELLITE TV MANUFACTURERS & DISTRIBUTORS:

Aditron Pte. Ltd.

10 Jalan Besar #09-01

Sim Lim Tower

Singapore 0820

Tel: (65) 298-3777

Fax: (65) 298-8077

Distributor of DX (Japan) satellite receivers and other TVRO, SMATV, and CATV equipment and accessories in Singapore, Malaysia, and Brunei.

Echosphere International

16A Science Park Drive

#04-03 The Pascal

0511 Singapore

Bert Klein, Director

Agnes Yeow, Marketing Executive

Tel: (65) 779-4166

Fax: (65) 779-6051

Manufactures and distributes TVRO and SMATV systems and components.

Exactel Communications Pte. Ltd.

315 Outram Rd.

#15-05 Tan Boon List Bldg.

Singapore 0316

Raymond Choy, Managing Director

Tel/Fax: (65) 227-7335

Products distributed: Satellite TVRO receivers (Star Trak), antennas, LNBs, LNBFs, feedhorns, actuators, and accessories.

Hy-Com Electronics Pte. Ltd

No. 1 Rochor Canal Rd. #03-35
Sim Lim Square
Singapore 0718
Tel: (65) 339-3630
Fax: (65) 339-3710

Jason Electronics Pte Ltd.

2 Alexandra Rd.
#07-06 Delta House
Singapore 0315
Tel: (65) 273-0211
Fax: (65) 273-4431

Klinton Engineering

BK 108 #01-40
Eunos Ave 4
Singapore
Tiah Tian Wah
William Wong J.S.
Tel: (65) 747-6711
Fax: (65) 841-0825

R & I Communications Pte. Ltd.

12 A Jalan Ave #02-01
Balestier Warehouse Complex
Singapore 1232
Franz Lambrechtstein, General Manager
Tel: (65) 256-5226
Fax: (65) 256-5064

Rediffusion (Singapore) Pte Ltd.

6 Harper Rd. #04-01/08
Leong Huat Bldg.
1336 Singapore
Thomas K.C. Yeo, Sales Mgr., Special Projects
Tel: (65) 383-2066, 383-2633

Satellite Television Systems Pte. Ltd.

5001 Beach Road #03-98H
Golden Mile Complex
0719 Singapore
Jeffrey W. Grice, Mng. Dir.

Products distributed: LNBs, feedhorns, TVRO antennas, receivers and accessories; services provided: turnkey design and installation of commercial TVRO/SMATV systems for hotels, embassies, clubs, etc.

Tee-Comm Electronics, Inc.

Singapore Representative Office
315 Outram Rd.
#15-05 Tan Boon List Bldg.
Singapore 0316
Art Goldstein, Director of Operations
Tel: (65) 227-7335

Manufacturer of TVRO receivers, antennas, and other satellite TV components.

Unify Engineering Pte. Ltd.

Blk 9005 Tampines Street 93
#02-246 1852 Singapore
Mr. C. S. Woon, Mng. Dir.
Tel: (65) 783-1111
Fax: (65) 783-7467

Products distributed: SMATV equipment.

SATELLITE DATA COMMUNICATIONS:

Pacific Data & Communications

580 Yio Chu Kang Rd.
#04-04 Thomson Grove
Singapore 2678
Frank H. Duyshart, Vice President
Tel: (65) 457-4058
Fax: (65) 457-4063

CATV/SMATV MANUFACTURERS:

Jerrold Communications

General Instrument Corporation
Level 36, Hong Laong Bldg.
16 Raffles Quay
Singapore 0104
Benny C.H. Chan, Regional Director Asia-Pac.
Tel: (65) 322-8552
Fax: (65) 225-9060

Scientific Atlanta

Tel: (65) 733-4314

SRI LANKA

Government: Republic
 Population: 17,850,000
 Gross National Product: US\$ 8.59 billion
 (1993 estimate)
 Language(s): Singhalese, Tamil
 Religion: Buddhist, Hindu,
 Muslim, Christian
 Time Standard: +5:30 GMT
 Currency Standard: Rupee
 (48.11 = US\$ 1)
 Video Standard: PAL (B)
 Electrical System: 230 a.c., 50 Hz.
 Telephone Country Code: (94)
 Major City Telephone Codes:
 Colombo, Moratuwa - 1
 Kandy - 8
 Galle - 9
 Jaffna - 21
 Trincomalee - 26
 Negombo - 31
 Number of TV Sets: 625,000

INTELSAT Representative:

Overseas Telecommunications Service (OTS)

P.O. Box 235
 Colombo 1 Sri Lanka
 Mr. K. K. Mahendiran
 General Manager/International Services
 Tel: (94) 1-28339/432201 ext. 232
 Fax: (94) 1-541414
 MAIN TEL: (94) 1-20163
 MAIN FAX: (94) 1-541-414

INTELSAT EARTH STATIONS:

LCS 1 - 63° E
 PADUKKA - 60° E
 TRINCOMALEE - 60° E
 (SRI LANKA BCT CORP.)
 (SCPC NETWORK)

SATELLITE COMPANIES:

East - West Enterprises Ltd.

P.O. Box 678
 Robert Senanayake Bldg.
 Mawatha, Colombo 2
 Sri Lanka
 Nahil Wijesuriya
 Tel: (94) 1-437-315
 Fax: (94) 1-437-420

Innovative Technologies

91A Colombo Rd.
 Piliyandala
 Sri Lanka
 P. Warnakulasuriya, Mng. Partner
 Mrs. Nillipa Warnakulasuriya, Partner
 Roshan Rupasinghe, Engineer
 Tel: (94) 78-60961
 Fax: (94) 1-575-032, 810989

Products manufactured: TVRO dishes up to 10m in diameter, receivers, VHF FM receiver modulators, and other custom electronics modules with emphasis on the higher end of the spectrum; products distributed: Drake, Chaparral, Nexus, Tratek, Com-Scope, Gilbert; services provided: consulting.

Micro Vision

16 U G People's Park
 Colombo 11 Sri Lanka
 Palytha Nugaliyadde, Proprietor
 Q.F. Gunarathe, Engineer, Electronics
 Upali Nugaliyadde, Director, Marketing
 Tamara Rodrigo, Director, Finance
 Tel: (94) 446519
 Fax: (94) 448857, 448833

Products manufactured: Solid and aluminum mesh dish antennas; products distributed: LNBs, feedhorns, receivers, and accessories.

Educational Organizations:

Arthur C. Clark Centre For Modern Technologies

Katubedda, Moratuwa
 Sri Lanka
 Tel: (94) 446546, 507461
 Fax: (94) 1-507-462

Home Satellite TV Legal Status: Legal

SYRIA



Government: Republic
 Population: 13,970,000
 Gross National Product: US\$ 12.5 billion
 (1993 estimate)
 Language(s): Arabic, Kurdish
 Religion: Muslim, 9%
 Christian minority
 Time Standard: GMT+2
 Currency Standard: Syrian Pound
 (20.25 = US\$ 1)
 Video Standard: SECAM
 Electrical System: 115/200 a.c., 50 Hz.
 Telephone Country Code: (963)
 Major City Telephone Codes: None

INTELSAT REPRESENTATIVE:**GENTEL DAMASCUS**

Tel: (963) 113-262

INTELSAT EARTH STATIONS:

DAMASCUS - 359° E
 SEDNAYA - 60° E

TAIWAN

Government: Republic
 Population: 21,120,000
 Gross National Product: US\$ 169.1 billion
 (1993 estimate)
 Language(s): Mandarin, English,
 Taiwanese
 Religion: Buddhist, with 7%
 Christian minority
 Time Standard: GMT+8
 Currency Standard: New Taiwan \$
 (26.68 = US\$ 1)
 Video Standard: NTSC
 Electrical System: 110/200 a.c., 60 Hz.
 Telephone Country Code: (886)
 Major City Telephone Codes:
 Taipei, Panchiao, Yunghu - 2
 Taichung - 4
 Tainan, Chiai - 6
 Kaohsiung - 7
 Keelung - 33
 Chungli - 34
 Hsinchu - 35

Number of TV Sets: 6,450,000

INTELSAT REPRESENTATIVE:**International Telecomm. Administration (ITA)**

31, Aikuo East Road
 Taipei, Taiwan (ROC)
 Mr. C.Y. Chow
 Director of Traffic and Commercial Department
 Tel: (886) 2-344-3766
 Fax: (886) 2-322-5104

ITDC TAIPEI

Tel: (886) 2-344-3702
 Fax: (886) 2-392-0454

EARTH STATIONS:

FANGSHAN 1 - 174° E
 TAIPEI 1 - 177° E
 TAIPEI 2 - 174° E
 TAIPEI 3 - 60° E
 TAIPEI 4 - 63° E

Home Satellite TV Legal Status: Legal

Asiasat EIRP/Coordinates:
Taipei: 35 dBW (2.4m TVRO)
Elevation: 55; Azimuth: 215

BROADCAST ORGANIZATIONS:

China Television Company (CTV)
120 Chung Yang Road
Nanking District
Taipei, Taiwan, ROC
Tel: (886) 2-783-8308
Fax: (886) 2-782-6007

**SATELLITE EQUIPMENT MANUFACTURERS
AND DISTRIBUTORS:**

Antenna Technology Inc.
No. 7, Lane 290, Nan Shang Rd.
Kueishan Hsiang, Taoyuan
Taiwan, ROC
Tel: (866) 3-322-3636~8
Fax: (866) 3-322-3639

Asian International Communications, Ltd.
3F, 56, Tun-Hua N. Rd.
Taipei, Taiwan ROC
Tel: (886) 2-778-2367
Fax: (886) 2-778-2868

Best Systems Corporation
5F No. 5 Lane 538,
Chung Cheng Rd.
Hsin Tien
Taipei Taiwan ROC
Solomon Wang, President
Jerry Liu, General Mgr.
Tel: (886) 2-218-6286
Fax: (886) 2-218-1508

Products manufactured: Satellite receivers, antenna positioners, and SCPC receivers; products distributed: LNBs, feedhorns, dish antennas and the necessary accessories for satellite TVRO systems.

Coast Hitech Corporation
1F, No. 22 East Industry Road
1X Science Based Park
Hsinchu 30077 Taiwan
Tel: (886) 35-783-261
Fax: (886) 35-780080

Comtex Microwave Corporation
4th Floor, 241 Sheng Li Rd.
Hsinchu, Taiwan
Tel: (886) 35-223-510
Fax: (886) 35-258-242

EN'SCO Co. Ltd.
38, Lane 155, Tun-Hua North Rd.
P.O. Box 81-110
Taipei, Taiwan ROC
E.K. Chang
Tel: (886) 2-713-1945

Golden Wave Company Ltd.
3F No. 25-3 Hsin Hsing St.
Shu-Lin, Taipei q
Hsien, Taiwan
Tel: (886) 2-680-8899
Fax: (886) 2-680-6699

Hyton Technology Corporation
25 Lane 576
Kuang Fu Road Sec 1
Hsinchu, Taiwan
Tel: (886) 357-88047
Fax: (886) 357-774-344

Hwang Piin Ind. Co. Ltd
No. 254 Chung Cheng Rd.
Lu-jou Hsiang
Taipei, Taiwan ROC
Jack C.H. Chang
Tel: (886) 2-281-6636~8
Fax: (886) 2-282-8180

Jaeger Industrial Co.
2F, No. 4, Lane 7,
Pao Kao Rd., Hsin Tien City
Taipei 231 Taiwan
Eric Show, President
Gary Wu, General Manager
Theodore Lee, Assistant Sales Manager
Tel: (886) 2-913-3422
Fax: (886) 2-917-8362

Products manufactured and distributed: actuators, horizon to horizon mounts, motorized az/el mounts, satellite receivers, satellite antenna positioners, satellite receiver with built-in positioner, and dual axis positioners.

Jaeger is specialized and experienced in motorization and positioning of satellite antenna systems. Jaeger supplies high quality actuator, horizon to horizon, mount and satellite receiver, positioner

under its own brand name "SuperJack, SuperMount, SuperTrack" for more than ten years. In addition, Jaeger also cooperates with several world-reknowned companies to manufacture satellite products under an OEM basis.

Jave Yuan Electric Wire Co. Ltd.

No. 122 Ping Ho Rd, Chung Ho City
PO Box 698 Yung Ho
Taipei, Taiwan
Tel: (866) 2-223-6696
Fax: (866) 2-222-6190

Products manufactured: air-spaced coaxial cables for satellite TV networks; products distributed: RG-11U and RG-6U; services provided: coaxial cables manufacturer technical consulting.

Jonsa TV Chung Enterprise

1 FL No. 11 Lane 160
Nan Hsing Road
Nantow City, Nantow Hsien
Taiwan
Tel: (886) 493-1711
Fax: (886) 493-50839

Microelectronics Technology Inc

No. 1 Innovation Rd. II
Hsinchu Science Based Industrial Park
Hsinchu 300 Taiwan ROC
Peter Pi, Director, TVRO/DBS/SMATV/CATV
Wesley Huang, Director, MIC components/VSAT/SCPC
Walter Yen, Director, Inmarsat Comm. Systems
Jack Lee, Sales Mgr, Telecom Systems/Fiber
Tel: (886) 35-773-335
Fax: (886) 35-777-121

Products manufactured: TVRO/DBS/CATV/MMDS, Video Link Products, microwave communication components/subsystems, VSAT/SCPC, Inmarsat Communications Systems: Inmarsat A,C & M Terminals; products distributed: fiber Optic Communications systems; digital microwave communications systems/Telecommunications Systems.

Nyron Communications, Inc.

2F., 521, Sec. 5, Chung Shan N. Rd.
Taipei 11120 Taiwan, ROC
N.R. Wang, Mng. Dir.
Tel: (886) 2-882-1257
Fax: (886) 2-882-2857

Products manufactured: Feedhorns, polarizers,

antennas, LNBs, receivers, and complete TVRO systems.

Sampo Corporation

216, Chung Shan Rd., Section 1
Pan Chao Taipei Hsen
Taiwan ROC
Tel: (886) 2-9611141
Fax: (886) 2-955988

SATenna Technology Ltd.

No. 7, Lane 116, Chun-Ying St.
Shu-Lin Chen
Taipei Hsein
Taiwan
Tel: (886) 2 682-4407
Fax: (886) 2 683-4198

S & T Machinery and Engineering Co. Ltd.

No. 6, Alley 1, Lane St.
Nankang Rd., Section 3
Nankang, Taipei, ROC
Tel: (886) 2-783-3711
Fax: (886) 2-785-3710

Shobel Industrial Co. Ltd.

P.O. box 530
Taoyuan, Taiwan
Richard Su, Mng. Dir.
Tel: (886) 23-339-0156
Fax: (886) 3-336-7045

Products manufactured: Antennas; products distributed: LNBs, feedhorns, and receivers.

Taiwan Microwave Communication Co. Ltd.

No. 16 Prosperity Road 2
Hsinchu Science-Based Industrial Park
Hsinchu, Taiwan ROC
Ron Shih, Chairman
Tel: (886) 35-781-380~9
Fax: (886) 35-781-386

Manufactures satellite antenna mounts

Teleconnex Satellite Inc.

13 Bao Din St.
Taoyuan, Taiwan
Tel: (886) 333-88610
Fax: (886) 333-88546

Trans Electric Co. Ltd

P.O. Box 18
Changhua, Taiwan
Tel: (886) 4-762-7131
Fax: (886) 4-762-7018

Tricomm Ltd.

207 Shou Chang Rd.
San Ming District Kaohsiung
Taiwan ROC
Tel: (886) 7-385-7905
Fax: (886) 7-385-7904

Vict International Corp.

3F, No. 239, Chung Ching N. Rd.
Sec. 4, Taipei, Taiwan, ROC
Tel: (886) 2-8161926
Fax: (886) 2-816-1925

Products distributed: DX (Japan) receivers and other TVRO, SMATV, and CATV products and accessories.

Winners Satellite Electronics Corp.

3F No. 4 Lane 263
Chung Yang Rd.
Taipei 11527 Taiwan
Anderson Chang, Sales Manager
Tel: (886) 2-780-0711
Fax: (886) 2-782-8490

Products manufactured: satellite TVRO receivers.

TELECOM PUBLISHERS:

Cable & Satellite TV Guide

23, Jenai Road, Sec. 3, #5F-1
Taipei, Taiwan
Vicky Tu, Publisher
Alan Shih, President
Tel: (886) 2-778-5818
Fax: (886) 2-778-5815

Publisher of the only trade magazine in the Chinese language in Taiwan. Circulation 20,000 to 25,000 copies. Taiwan Satellite & Cable TV Buyer's Guide - an annual publication, circulation - 15,000 copies; products distributed: Publications distributed in Taiwan, Hong Kong and China; services provided: Information service, cable management consulting.

Rainmaker Industrial Inc.

2F, No. 20, Alleyis Lane 2
Kuang Fu St. Yung Ho
Taipei Taiwan ROC
Chih Long Wang, General Mgr.
Hazel Sun, Manager of Domestic Bus. Dept.
Tel: (886) 2-924-2606
Fax: (886) 2-922-9841

Services: since August 1991, we have been conducting a survey on satellite TV and cable TV, which has monthly and annual reports that are exclusively proceeded in Taiwan. As a pioneer survey, it includes the thorough aspects of the new electrical technology diffused on this island.

SHOW ORGANIZER:

Taipei Cable and Satellite '94

23 Jenai Rd., Sec. 3
Taipei Taiwan
Tel: (886) 2-778-5818
Fax: (886) 2-778-5815

TAJIKISTAN



Government:	Republic (Member CIS)
Population:	5,423,000
Gross National Product:	US\$ 12.5 billion (1993 estimate)
Language(s):	Tajik, Uzbek, Russian
Time Standard:	GMT+6
Currency Standard:	Rouble (1.65 = US\$ 1)
Religion:	Muslim with Christian minority
Video Standard:	SECAM
Electrical System:	127/230 a.c., 50 Hz.

Telephone Country Code: (7)
Major City Telephone Codes: None

INTELSAT REPRESENTATIVE:

**Ministry of Communications
Tajikistan**

Mr. Shnitman Efim Nacmovich
Head, Dept. of Communications
Broadcast & TV
Tel: (7) 3372-27-65-80
Fax: (7) 3372-27-98-06

Major City Telephone Codes:

Bangkok - 2
Chon Buri - 38
Khon Kaen - 43
Nakhon Ratchasima - 44
Chiang Mai - 53
Phitsanulok - 55
Songkhla, Hat Yai - 74
Nakhon Si Thammarat - 75
Phuket - 76

Number of TV Sets: 5,165,000

THAILAND



INTELSAT REPRESENTATIVE:

Communications Authority of Thailand

(INTLCAT BANGKOK)
Satellite Telecommunications Division
Bangkok 10002 Thailand
Mr. P. Hetrakul
Director, INTELSAT Operations Representative
Tel: 66-2-573-5453

INTELSAT EARTH STATIONS:

SI RACHA 2 - 63° E
SI RACHA 4 - 174° E
SI RACHA 5 - 60° E
UDORN - 57° E
(VOICE OF AMERICA)

In addition to the above-mentioned international earth stations, Thailand also has thirty-two domestic earth stations which receive TV programming from the INTELSAT satellite at 57 degrees East Longitude.

REGULATORY AGENCIES:

Post & Telegraph Department

Kitti Yupho, Ph. D., Director General
Precha Boonprasert, Director of
Office of Civil Communications/
Telephone communications
Bangkok 10400 Thailand
Tel: (66) 2-271-0151-60
Fax: (66) 2-271-3514

Government:	Constitutional Monarchy
Population:	58,420,000
Gross National Product:	US\$ 80.5 billion
Language(s):	Thai, Chinese Lao, and Malay
Religion:	Buddhist
Time Standard:	GMT+7
Currency Standard:	Baht (25.25 = US\$ 1)
Video Standard:	PAL (BM)
Electrical System:	220/380 a.c., 50 Hz.
Telephone Country Code:	(66)

OVERSEAS SATELLITE SERVICES:

OTC Australia

(Representative Office)
7th floor, IBM Building
388 Paholyothin Rd.
Bangkok 10400 Thailand
Tel: (66) 2-273-0663
Fax: (66) 2-273-0662

DOMESTIC SATELLITE OPERATOR:

Shinawatra Satellite Public Co. Ltd.

Thaicom Satellite Station
41/103 Rattanathibet Rd.
Nonthaburi 11000
Thailand
Paiboon Panuwattanawong, Spacecraft Manager
Yongsit Rojsrivichaikul, Marketing Manager
Panwadee Chantori, Marketing Comm. Officer
Avudh Ploysongsang, Dr. Project Director
Commercial Dept.
Tel: (66) 2-591-0736
Fax: (66) 2-591-0719

Estimated No. of TVRO Systems: 36,000

Home Satellite TV Legal Status: Legal

BROADCAST TV & RADIO ORGANIZATIONS:

Bangkok Entertainment

(Thai TV, Color Channel 3)
1126 New Phetburi, Phayathai
Bangkok 10400 Thailand
Vichai Maleenont, Managing Director
Udom Chanopas, Assistant
Managing Director
Tel: (66) 2-253-9940
Fax: (66) 2-253-9978

Royal Thai Army TV

(Channel 5 - Bangkok)
Thanon Paholyothin Sanampao
Bangkok 10400 Thailand
Jarupun Buranasongkarm, Managing Dir.
Tel: (66) 2-271-0060
Fax: (66) 2-278-1510

**BBTV - Bangkok Broadcasting
& TV Co. Ltd.** (Channel 7)

998/1 Phaholyothin
Jatujak, Bangkok 10900 Thailand
Chatchur Kamasuta, Managing Director
Tel: (66) 2-278-1255
Fax: (66) 2-270-1976

**Mass Communications Organization
of Thailand** (Channel 9 - Bangkok)

222 Din Daeng
Rama IX, Huaykwang
Bangkok 10310
Tel: (66) 2-245-0700
Fax: (66) 2-245-1644

Television of Thailand

(Channel 11 - Bangkok)
New Phetburi
Huay Kwang
Bangkok 10310 Thailand
Vichit Wuthi-uppol, Managing Director
Choosak Rongsawat, Executive Producer
Tel: (66) 2-318-3114
Fax: (66) 2-318-2991

MMDS/PAY TV SERVICES:

IBC Cable TV

1376/1 Nakomchaisri Rd.
Dusit Bangkok 10300
Thailand
Phensom Damapong, Asst. General Mgr.
Tel: (66) 2-243-5300
Fax: (66) 2-243-5987

Thai Sky TV

21 Pacific Tower, 9-10th FL
Viphavadi-Rangsit Rd.
Jatujak
Bangkok 10900
Thailand
Tel: (66) 2-273-8967
Fax: (66) 2-273-8962

SATELLITE RADIO SERVICES:

Radio Thailand

236 Vibhavadi Rangsit Superhighway
Din Daeng, Huai Khwang
Bangkok 10400 Thailand
Chuansith Sirikhan, Engineer
Tel: (66) 2-277-8487

THAI VSAT OPERATORS:**Acumen Co. Ltd.**

333 Laksi Plaza Tower 2, 6th Fl
 Chaengwatana Rd.
 Donmuang, Bangkok
 10210 Thailand
 Terasak Jerauswapong,
 Manager, Service Operation
 Tel: (66) 2-576-0200~9
 Fax: (66) 2-576-0198

Compunet Corporation Ltd.

B.B. Building, 19th Floor
 Suites 1906-08
 54 Asoke Road Sukhumvit 21
 Bangkok 10110 Thailand
 Philip J. Richards, Managing Director
 David M. Haworth, Manager Marketing
 W. Randolph Anwell, Manager Engineering
 Ms. Srisuda Phetnaih, Manager Finance
 Tel: (66) 2-260-7305~8
 Fax: (66) 2-260-7309

Services: VSAT network operator. Operates shared hub service (since 1990) around Thailand for banks, brokers, manufacturers, leisure, transport, oil and insurance sectors. Offers a high reliability thanks to an extensive microwave distribution system around Bangkok. Uplink services available upon request.

Samart Telecom Co., Ltd

36/28-35 Ngam Wong Wan Road
 Bangkhen, Bangkok 10900
 Chatchai Bunnag, Managing Director
 Tel: (66) 2-589-1047, 589-6862, 589-7855
 Fax: (66) 2-589-3066

Thai Skycom Ltd.

16th Floor, TST Tower
 21 Vibhavadi Rangsit Rd.
 Bangkok 10900 Thailand
 Choakdee Dhamasaroj, Manager,
 Research & Development Division
 Nipon Chartkul, Asst. Mgr.
 Tel: (66) 2-273-8723
 Fax: (66) 2-273-8725

TT&T - Thai Telephone & Telecommunication Co. Ltd.

333 Laksi Plaza Tower 2, 5th Fl
 Chaengwatana Rd.
 Bangkok 10210 Thailand
 Tel: (66) 2-576-0526
 Fax: (66) 2-576-0662

SATELLITE TELECOM COMPANIES:**Digitalcom Co. Ltd.**

888/178 Ploenchit Rd.
 17th Fl., Mahatun Plaza Bldg.
 Bangkok 10330 Thailand
 Suwich Chitasemsuk, Mgr.
 Engineering Dept.
 Surin Arreewanit, Business Devt.
 Tel: (66) 2-254-5525~9
 Fax: (66) 2-254-5530

VSAT DISTRIBUTORS/INSTALLERS:**Future Hi-Tech Co. Ltd.**

68 Sukhumvit 31
 Bangkok 10110 Thailand
 Rachanee Yingchairak, Mng. Dir.
 Tel: (66) 2-258-2889, 259-9853~4
 Fax: (66) 2-258-8097

Jasmine International Co. Ltd.

333 Laksi Plaza, 6th Fl., Tower 2
 Chaengwatana Rd. Don Muang
 Bangkok 10210 Thailand
 Suraphol Chanpetch, Chief Tech. Staff
 Tel: (66) 2-576-0200~9
 Fax: (66) 2-576-0198

Sci-Tech (Thailand) Co. Ltd.

134/1-2 Asvinvichit Blvd.,
 Silom Rd. Bangkok
 10500 Thailand
 Chaktra Chaichana, Tech Mgr.
 Tel: (66) 2-235-6512
 Fax: (66) 2-237-2057

SATELLITE PUBLISHERS:

Satellite Thailand Magazine

(World of Satellite TV—Thai edition)
17/749, 4th Floor, Wanghin Condominium,
Soi Senanikhom 1,
Phaholyothin Rd., Ladphrao
Bangkok 10230 Thailand
Vichan V. Thaveekij
Managing Editor
Tel: (66) 2-570-5335, 570-4339-41
Fax: (66) 2-570-5379

Loxley (Bangkok) Limited

(STAR TV Guide)
304 Suapah Road
Bangkok 10110 Thailand
Tel: (66) 2-221-9711, -9743,
-0199, -6121
Fax: (66) 2-224-4499
Vasant Chatikavanji, Publisher

**SATELLITE TVRO INDUSTRY
TRADE ORGANIZATION:**

Satellite Business Development

Organization of Thailand (SBDT)
c/o Antech Communication Co. Ltd.
2540 Sukhumvit Avenue
Bangna, Bangkok 10260
Contact: Rux Jira Ph. D.,
Tel: (66) 2-398-6952~5
Fax: (66) 2-398-6956

**SATELLITE TVRO MANUFACTURERS
AND DISTRIBUTORS: (BANGKOK):**

AA Aaron Co. Ltd.

Brand name: AARONSTAR
44/9 Soi 31, Charoenkrung Rd.
Bangkok 10100, Thailand
Nopadol Daorunklet
Satellite Department Manager
Tel: (66) 2-237-3861~9, 237-9662~76
Fax: (66) 2-236-3265

Abacus Futuretech Co.,Ltd.

Brand name: Worldsat
1697/2-3 Opp. Soi Ladphrao 48
Ladphrao Rd.
Bangkok 10310 Thailand
Kittipoom Watanasiri, Managing Director
Tel: (66) 2-512-2925, 512-2885-6
Fax: (66) 2-512-2926

Aerotek Satellite Technology Co. Ltd.

1540, 5th FL, Nippon Building
Sutthisarn Rd., Huaykwang
Bangkok 10310, Thailand
Pairoj Sakulsupich
Tel: (66) 2-276-0825
Fax: (66) 2-276-0826

Antech Communication Co. Ltd.

Brand name: Starvision
2540 Sukhumvit Avenue
Bangna, Bangkok 10260 Thailand
Rux Jira Ph. D., Director
Anant Chotamano, Sales Manager
Tel: (66) 2-398-6952
Fax: (66) 2-398-6956

A.M.S. Antech Co. Ltd.

Thongnuame
66/15 Rama 3 Road
Chongnonsi, Yanawa
Bangkok 10210 Thailand
Tel: (66) 2-249-9137

A-Sat Co. Ltd

232/1-2 Srinakarin Rd., Samrongnua
Samutprakarn 10270 Thailand
Tel: (66) 2-385-7136
Fax: (66) 2-385-7136

Computech Microsystems Co. Ltd.

Brand name: Laser
5th Floor MK Bldg, 719 Chula Soi 10
Bantadtong Rd., Pathumwan
Bangkok 10330 Thailand
Wachara Mongkonsuthornchote,
Managing Director
Tel: (66) 2-215-5122
Fax: (66) 2-216-6059

Comstar Co., Ltd.

808/6 Sukhumvit 55 (Thong Loh)
Bangkok 10110 Thailand
Pornpod Thongmeearkom, Managing Director
Benjaporn Jirapivong, General Manager
Tel: (66) 2-391-1729
Fax: (66) 2-391-1729

Products distributed: Star*Trak satellite TVRO equip-
ment from Tee-Comm Inc. of Canada.

CS International Co. Ltd.

Brand name: Agilis
 1515 Soi Kwaeng Rung Kwaeng Loi
 Teparak Rd., North Samrong
 Samutprakarn, Thailand
 Wisai Sotiwanwong, Managing Director
 Tel: (66) 2-384-3830~2
 Fax: (66) 2-384-3833

Dynamic Satcom Co., Ltd.

Brand name: Dynasat
 158 Soi wongsawang 21
 Wongsawang Rd., Bangsue,
 Bangkok 10800 Thailand
 Jirawan Aonnum, General Manager
 Tel: (66) 2-587-2440
 Fax: (66) 2-587-2443

First Coordinated Telecom Co. Ltd.

72/18 Soi Rewadee
 Tiwanon Rd.
 Talaadkwan Subdivision District
 Muang, Nonthaburi 1000 Thailand
 Tel: (66) 2-580-7447, 580-9477
 Fax: (66) 2-580-7447

Global Reach Co., Ltd.

625/3 Soi Nora-u-tis,
 Nakornchaisri Rd., Dusit,
 Bangkok 10300 Thailand
 Tel: (66) 2-243-6190-1, 243-5972-4
 Fax: (66) 2-243-6192

Icon Telecommunication Co., Ltd.

800 Phanurangsri Rd., Wangburapha,
 Bangkok 10200 Thailand
 Tel: (66) 2-222-4260
 Fax: (66) 2-222-4260

Impress Group Co. Ltd.

55/150 Suttisarnwinitchai, Sansennok
 Huaykwang, Bangkok 10310 Thailand
 Tel: (66) 2-2751809, 233-5699

Krops Ventures Co. Ltd.

333/1 Soi Measuwan 3 Klongtan
 Prakanong Bangkok 10110 Thailand
 Tel: (66) 2-38-1440, 391-1092

Loxley (Bangkok) Ltd.

2 Soi Khemchai
 Phaolyothin Rd.
 Bangkok 10900 Thailand
 Sithsak Hussein
 Tel: (66-2) 512-2383
 Fax: (66-2) 513-0659

Metro Tower Co. Ltd.

820 Prasumane Rd.
 Bangkok 10200 Thailand
 Cherd Viriyah Bhanij, Chairman
 Tel: (66) 2-281-5707, 282-6249, 282-7910

Modern Innovation Co. Ltd.

Brand Name: MISAT
 11/6 Sukhumvit 77
 Bangkok 10250 Thailand
 Kaewjai Saravutjirapong
 Srirat Nuchniyam, Managing Director
 Tel: (66) 2-332-8320~1
 Fax: (66) 2-332-3231

PTR Group

Brand name: Topsat
 112 Thirddthai Rd, Bookkalo
 Thonburi, Bangkok 10600 Thailand
 Pairoj Tangcharoenpanich, Managing Director
 Tel: (66) 2-476-8627~8
 Fax: (66) 2-476-8133

Root International Co. Ltd.

70/7-8 Srinakarin Rd.
 Nongbon, South Prakanon
 Bangkok 10260 Thailand
 Tel: (66) 2-399-2362~70

Samart Corporation Public Co. Ltd.

37/1 Moo 2 Phaholyothin Rd.
 Pathumthani 12120 Thailand
 Mr. Charoenrath Vilailuck, Executive Chairman
 Mr. Prayoon Kongkathong, Vice Exec. Chairman
 Mr. Thavatchai Vilailuck, President
 Mr. Sanpat Sopon, Vice President
 Tel: (66) 2-516-1041
 Fax: (66) 2-516-1594

Products distributed: satellite modem, transceivers, multiplexers, video conferencing systems, satellite data receivers. services provided: Telecommunication Turnkey projects.

Samart Engineering Co. Ltd.

59 Moo 2 Phaholyothin Rd.
 Puthumthane 12120 Thailand
 Mr. Cherdchai Vilailuck, Chairman
 Mr. Charoenrath Vilailuck, Vice Chairman
 Mr. Thavatchai Vilailuck, Managing Director
 Mr. Boonthong Sarasri, General Manager

Products manufactured: Satellite solid antenna, television antenna, TV accessories, booster, filter

and combiner, coaxial cable.

Samart International Co. Ltd.

Juthamard Bldg., 7th Floor
89/170 Phaholyothin Rd., Donmuang
Bangkok 10210 Thailand
Mr. Sanpat Sapon, Vice President
Mr. Tawatchai Theerakul, Int. Mkg. Dir.
Tel: (66) 2-589-1047, -6862
Fax: (66) 2-589-7855, -580-7350

Products distributed: Satellite TV receiver, satellite TV antenna, satellite solid antenna, satellite TV accessories, MMDS antenna dish, TV antenna, U/V combiner, SMATV, MATV, CATV systems (Import-Export only).

Samart Satcom Co. Ltd.

37/1 Moo 2 Phaholyothin Rd.
Klong 1, Klong Laung
Pathumthanee 12120 Thailand
Mr. Cherdchai Vilailuck, Chairman
Mr. Charoenrath Vilailuck, Vice Chairman
Mr. Pornthep Prasitkunaporn, Mng. Dir.
Mr. Atcha Auernarueminsuk,
Senior Production Director
Mr. Kitsanan Ngamphathipong,
Senior Business Director
Mr. Payub Malaisri, Engineering Director
Tel: (66) 2-516-1188
Fax: (66) 2-516-8854

Products manufactured: Satellite TV Antenna, Satellite TV receiver, positioner, MMDS antenna dish, U/V combiner under the brand name "Samart.". Products distributed: Satellite TV receiver, satellite TV antenna, MMDS, U/V combiners, and all related satellite components. Services: Satellite Data Communications services through Samart Telecoms Co. Ltd. Uplink and maintenance services via Samart Communication Services Co., Ltd. Telecommunication Turnkey Projects via Samart Corporation Public Co. Ltd.

Established in 1989, Samart Satcom manufactures satellite TV dishes and receiving equipment for home use. With the demand for new home entertainment increasing rapidly, the satellite dish market has become the most exciting industry within the telecommunications sector. Satcom recognizes the potential of this growing market and has expanded its manufacturing and marketing capabilities to meet this demand. Having been granted promotional privileges by the Thai government Board of Investment, Samart Satcom now exports some of its

output to the overseas market.

Satelland Co. Ltd

Brand name: Satelland
3rd Floor, C2 Bldg
290 Soi Japanese School, Rama IX Rd
Bangkok 10310 Thailand
Thanin Pokitsakul, General Manager
Tel: (66) 2-318-5596~7
Fax: (66) 2-319-3508

Sea Sat Communication Co. Ltd.

Brand Name: Seasat
537/38-9 Satupradit Complex, Satupradit Rd.
Bangpongpan, Yannawa
Bangkok 10120 Thailand
Verayuth Puwanacharoen, Managing Director
Tel: (66) 2-294-9159~61, 294-0814
Fax: (66) 2-294-9029

Sirius Co. Ltd.

126/67 Sikharin Place
Soi Ramkhamhaeng 24
Ramkhamhaeng Rd. Hua-Mark
Bangkok 10240 Thailand
Mr. Prasit Sangkla, Executive Director
Tel: (66) 2-300-4997
Fax: (66) 2-300-4309

Products manufactured: satellite antennas; products distributed: satellite antennas, receivers and SMATV headend equipment; services provided: TV signal distribution technical consulting.

Skawol (Thailand) Co. Ltd.

48/4 Moo 7 Soi Saoyai
Bangmodpattana Rd.
Bangmoo Jomthong
Bangkok 10150 Thailand
Raymond Li
Sales and Marketing Manager
Tel: (66) 2-428-0033
Fax: (66) 2-428-5477

Spa Communications Co. Ltd

44/21-22 Ngarm Wongwan Rd., Jatujak,
Bangkok 10900 Thailand
Watcharee Jaima, General Manager
Tel: (66-2) 5915205
Fax: (66-2) 5169845

Starsat Ltd. Partnership

Brand name: Nokia
21/3-4 Chaiyapruk Rd. Mu 2
Talingshan,
Bangkok 10170 Thailand
Surapan Supadirekkul, General Manager
Tel: (66) 2-433-6474
Fax: (66) 2-435-9391

Starsat Ltd. Partnership

Brand name: Nokia
ShowRoom:
39/15, 17 Pinklao-Nakornchaisri Rd.,
Talingshan, Bangkok 10170 Thailand
Tel: (66) 2-433-9962
Fax: (66) 2-435-9391

Thai Network Center Co., Ltd.

222/25 Langluang Rd.
Bangkok 10100 Thailand
Kiattichai Santhongprasert
Marketing Manager
Wiroon Tangsaksit, Mng. Dir.
Tel: (66) 2-282-5286, 88, 90
Fax: (66) 2-281-6652
Products manufactured: satellite antennas; Products distributed: LNBs, feedhorns, antennas, satellite receivers, and other related equipment; services provided: transponder brokerage.

Thai Vasco (1977) Ltd.

287/23-24 Surawongse Rd.
Bangkrak, Bangkok Thailand
Chaiyong Banyatsupasil, Managing Director
Tel: (66-2) 233-6594~5
Fax: (66-2) 237-5754

Products distributed: DX (Japan) satellite receivers and other TVRO, SMATV, and CATV products and accessories.

Tack Heng Long

2008 Chan Road
Yannava, Bangkok
Thailand
Tel: (66) 2-256-0453

WAS Trading Corporation

33/409 Soi 3 M, Bang Na Villa
Soi Som Hi Run
Bang-Na Trad Road
A. Bangplee, Samut Prakam
10540, Thailand
S.K. Nielson

Tel: (66) 2-398-7610

Winson Telecom Co. Ltd.

51/319-320 Drive-In Square Soi 3
Lardprao Rd., Bangkok
Bangkok 10240 Thailand
Sahat Sirikate, General Manager
Tel: (66) 2-731-0350~6
Fax: (66) 2-377-9075

Worachak International Co. Ltd.

Phaisan Sirirat-usdom
Hong Silom Bldg.
4th-5th FL, 723 Silom Road
Bangkok 10500 Thailand
Tel: (66) 2-234-4166~8, 235-4195~9

**SATELLITE TVRO DISTRIBUTORS
(NORTHERN):****Lanna Supply Co. Ltd.**

49/16 Huay Kaes Rd., A. Muang
Chiang Mai 50000 Thailand
Mr. Postawat Vilsihongsa, Managing Director
Ms. Apsorn Vasuratna, Exec. Dir.
Mr. Dejana Siroros, Exec. Dir.
Tel: 66-53-212-727
Fax: 66-53-217925

Products distributed: LNBs, feedhorns, antennas, satellite TV receivers, and SCPC receivers; Services provided: technical consulting, help desk, and satellite installations.

OTHER:**Sky Sat Ltd.**

786/37 Thanglor Tower
Soi Thonglor Soi
Sukumwit 55
Bangkok 10110 Thailand
Jay C. Adair, Executive Director
Pilanya Plookchareon, Managing Director
Tel: (66) 2-381-8054
Fax: (66) 2-322-3480

Services provided: Television programming distributor, SMATV developer, owner and operator for Thailand and Southeast Asia. TV, cable, satellite consulting. Heavily focused in pay TV and pay-per-view services to hotels.

(For information on the Thaicom satellite system, see Chapter Ten.)

TONGA

Government: Constitutional Monarchy, Commonwealth Member (U.K.)
 Population: 104,000
 Gross National Product: US\$ 100 million (1993 estimate)
 Language(s): Tongan
 Religion: Free Wesleyan, 16% Catholic minority
 Time Standard: GMT+13
 Currency Standard: Pa'anga (1.33 = US\$ 1)
 Video Standard: None
 Electrical System: 230 a.c., 50 Hz.
 Telephone Country Code: (676)
 Major City Telephone Codes: None

INTELSAT REPRESENTATIVE:**Cable & Wireless Plc**

Private Mail Bag 4
 General Post Office
 Nuku' alofa
 Kingdom of Tonga
 Mr. Phil Summer
 Engineering Manager
 Tel: 010-676-23807
 Fax: 010-676-22970

INTELSAT EARTH STATION:

NUKU' ALOFA - 174° E

TURKEY

Government: Republic
 Population: 61,190,000
 Gross National Product: US\$ 94 billion (1993 estimate)
 Language(s): Turkish, Kurdish
 Religion: Muslim
 Time Standard: GMT+2
 Currency Standard: Turkish Lira (5,750.29 = US\$ 1)

Video Standard:
 Electrical System:
 Telephone Country Code: (90)
 Major City Telephone Codes:
 Istanbul - 1
 Ankara - 41
 Izmir - 51
 Eskisehir - 221
 Bursa - 241
 Konya - 331
 Kayseri - 351
 Adana - 711
 Mersin - 741
 Diyarbakir - 831

BROADCAST SERVICES:**HBB**

Buyukdere cad n. 187
 TUR-80720 Levent
 Istanbul
 Tel: (90) 1-281-4800
 Fax: (90) 1-281-4808

InterStar

Devan-Olu Turbadas
Fokok 22, Istanbul
Tel: (90) 1-511-4328
Fax: (90) 1-511-8999

Kanal 6

Seyrantepe, Imorncesmecod 648
Sok n. 12, TUR-80660 4-Levent
Istanbul
Tel: (90) 1-285-1250
Fax: (90) 1-285-1263

Show TV

AKS TV, Halaskargazi
Caddesi 180, Osmanbey
TUR-80220 Istanbul
Tel: (90) 1-246-1260
Fax: (90) 1-247-577-880

**Turkish Radio Television (TRT) International
(TRT 1, 2, 3, & 4)**

Genel Mud 06109
Kavaklidare, Ankara
Tel: (90) 4-1282-230
Fax: (90) 4-1315-791

INTELSAT REPRESENTATIVE:**General Directorate of PTT**

06101 Ankara Turkey
Mr. Cengiz Anik, Head of International Relations
Tel: (90) 4-309-1112
Fax: (90) 4-310-7686
MAIN Tel: (90) 41-499-5151
MAIN Fax: (90) 41-310-9141

INTELSAT EARTH STATIONS:

ACIBADEM - 342° E
ANKARA 1 - 335.5° E
ANKARA 3 - 60° E
ANKARA 9 - 57° E
ANKARA 10 - 359° E
ANKARA 12 - 60° E
ERZURUM 2 - 359° E
INCIRLIK 3 - 359° E

KU-BAND TRANSPORTABLES

In addition to the above-mentioned international earth stations, Turkey also has 13 domestic earth stations which interface using the INTELSAT satellites at 359, 57 and 60 degrees East Longitude.

The Turksat Domestic Satellite System

In 1989, Turkey's General Directorate of PTT launched an international tender for the delivery, on a turnkey basis, of the country's first domestic telecommunication satellite system. In August of 1990, after the evaluation of offers from the European and American industries, the General Directorate of the Turkish PTT selected the French company Aérospatiale for the development of the "Türksat" satellite system. The contract, which was for approximately US\$ 300 million, was signed on December 21, 1990.

Aérospatiale is leading a European consortium including Alcatel Espace, France and its Turkish subsidiary Teletas, MBB (DASA) in Germany, and Arianespace, and Execorp in France. Aérospatiale will deliver two satellites in orbit through contracts for two Ariane 4 launches, build two controlling earth stations, and be responsible for in-orbit operations. In addition, the contract covers the training of personnel, insurance, and the financing for the program.

Ground control stations located in Ankara and Istanbul will handle operations over the lifetime of the satellites. Aérospatiale will provide the system software and will provide technical support to the user personnel.

Aérospatiale has ordered two Ariane 4 launches for the Türksat satellites from Arianespace. The launches are planned for 1994 from the Guiana Space Center to 31 and 41 degrees East Longitude, respectively. The Türksat satellites will share these launches with other payloads, and will occupy the lower section of the SPELDA, Ariane 4's dual launch device.

Türksat Satellite Services

Each Türksat satellite will carry sixteen Ku-band transponders and cover three dis-

tinct zones: Central Turkey, Central Europe, and East Turkey. Turkey plans to transmit twelve TV channels through Türksat. These services will be of Turkish national or international origin. The government of Turkey also intends to use Türksat for national development with educational TV broadcasts for high schools and universities and exchanges between members of the scientific community. Twenty high-quality stereo radio transmissions also will be provided. These TV and radio broadcasts will be received with small 50cm antennas.

In addition, Türksat will furnish numerous other non-video services, including telex, fax, telephone, and data transmissions. These voice and data services, which will be simultaneously available throughout Turkey, are of particular importance to areas where geographical conditions make it difficult to establish microwave links and cable systems. Türksat also will allow for expansion and ensure a reliable back-up to existing terrestrial facilities in Ankara, Istanbul, Adana, and Izmir.

Türksat will provide reliable, high-quality communications links to the whole Turkish community, including the National Department of Defense. Commercial and economic benefits also will be obtained through services to businesses, banks, hotels, airlines, newspapers, distribution centers, and the trucking industry.

Turkey's domestic telecommunications industries will be associated in the development of the Türksat program. Teletas, for example, will provide tooling and equipment for the ground control stations and will develop small antennas for TV reception.

Türksat Telecommunications Payload

The Türksat telecommunications payload receives, amplifies, and retransmits signals from satellite earth stations down on the ground. This Ku-band payload is comprised



*Türksat Central
Beam Coverage
from 42 degrees
East Longitude*

Peak EIRP:	50 dBW
1st contour:	48 dBW
2nd contour:	46 dBW
3rd contour:	44 dBW
4th contour:	40 dBW
5th contour:	32 dBW



*Türksat European
Beam Coverage
from 42 degrees
East Longitude*

Peak EIRP:	52 dBW
1st contour:	50 dBW
2nd contour:	48 dBW
3rd contour:	46 dBW
4th contour:	42 dBW
5th contour:	32 dBW

of the repeater and the antenna subsystems. Derived from the antenna qualified in orbit for Eutelsat II, the Türksat payload antenna consists of a single assem-

bly with an advanced multifeed and a dual-grid reflector that guarantees a high level of performance and flexibility.

The repeater features twenty-four output power amplifiers in two 12-for-8 redundancy rings. In each of these rings, any amplifier chain may be used to replace any other for any channel. This unusually high level of redundancy will offer the highest possible system reliability. The satellite's solid state input amplifiers feature an exceptionally low noise figure across the overall receiver bandwidth.

The on-board reconfigurability permits the allocation of up to four channels to the Central European coverage zone and up to two channels to the East Turkey zone by ground command. This will make it possible, for example, to send Turkish television programming to Central Europe, and to receive television programming from Central Europe in Turkey. The gain of each channel amplifier stage can be adjusted by telecommand.

The satellite's telemetry, telecommand, and ranging subsystem will supply rapid and complete information to ground controllers concerning the status of the satellite and will enable commands to be sent from the ground to remotely operate the spacecraft. The system is fully redundant and protected from outside interference.

Türksat Controlling Earth Stations

The fully-redundant main ground station will be located near Ankara. The back-up control station, located in Istanbul, can be remotely controlled from Ankara or function autonomously. One of the Ankara antennas will have special characteristics that will make it possible for the station to be integrated into the world tracking network, and to participate in the launching and stationkeeping operations of Türksat satellites as well as other satellites.

TURKMENISTAN



Government:	Republic (Member CIS)
Population:	3,800,000
Gross National Product:	US\$ 13 billion (1993 estimate)
Language(s):	Turkmen, Russian, Uzbek
Religion:	Muslim, Christian Orthodox minority
Time Standard:	GMT+5
Currency Standard:	Rouble (1.65 = US\$ 1)
Video Standard:	SECAM
Electrical System:	
Telephone Country Code:	(7)

INTELSAT REPRESENTATIVE:

Ministry of Communications

744000 Ashkabad
Zhitnikova 36
Turkmenistan
Mr. Mamedov Ayembardi
Head of Technical Department
Tel: 7-3632-25-40-20
Fax: 7-3632-29-04-20

INTELSAT EARTH STATION:

AWGABT - 63° E (IBS)

UAE (UNITED ARAB EMIRATES)



Government: Emirate Federation
Population: 2,670,000
Gross National Product: US\$ 26 billion
 (1993 estimate)
Language(s): Arabic, Malayalam,
 Baluchi, Pashto,
 Farsi
Religion: Muslim
Time Standard: GMT+4
Currency Standard: Dirham
 (3.67 = US\$ 1)
Video Standard:
Electrical System:
Telephone Country Code: (971)
Major City Telephone Codes:
 Abu Dhabi - 2
 Dubai - 4
 Sharjah - 6
 Ras al-Khaimah - 77

INTELSAT REPRESENTATIVE:

ETISALAT ABU DHABI

Tel: 971-2-729-898
 Fax: 971-2-725456

INTELSAT EARTH STATIONS:

ABU DHABI - 342° E
 DUBAI - 60° E
 RAS AL-KHAIMAH - 63° E

BROADCAST SERVICES:

Dubai Radio and Color TV

P.O. Box 1695
 Dubai, United Arab Emirates

SATELLITE COMPANIES:

Gulf Satellite Trading Est.

P.O. Box 20374
 Dubai, United Arab Emirates
 Samer Karaman
 Tel: (971) 4-823-941
 Fax: (971) 4-823-397

International Communications Systems

Galleria #1313 Box 6655
 Dubai UAE
 John Howard Koch, General Manager
 Aaron Chamberlain, Dubai Branch Manager
 Tel: (971) 4-206-5593
 Fax: (971) 4-206-5573

Products distributed: various satellite systems/uplinks, etc. Services: Technical consulting, project management and implementation.

MAF Telecom

P.O. Box 60811
 Dubai, UAE
 K. Hashimoto, V.P. Planning
 S. Mehrabanzad, General Manager Telecom
 A. Naqvi, Technical Manager

Products distributed: LNBs, feedhorns, antennas, receivers, SMATV, videoconferencing, mobile communications products, VSATs, and test equipment.

Power Engineering

P.O. Box 1577
 Dubai, UAE
 Mr. P.M. Masters, Technical and General Manager
 Tel: (971) 4-212-545
 Fax: (971) 4-234-127

Products distributed: WISI (Germany) SMATV, Alcad (Spain) SMATV, and Irco (Spain) MATV. Also audio/video and security systems. Services: Technical consulting, planning and designing of MATV & SMATV Systems.

Teletron

P.O. Box 2946
 Abu Dhabi
 United Arab Emirates
 Emad K. Korty, Managing Director
 Chassan K. Kobty, General Manager
 Tel: (971) 2-795-333
 Fax: (971) 2-794-609

Products distributed: LNBs, feedhorns, antennas, receivers, accessories, test equipment, MATV systems, CATV systems, etc. Services: Technical consulting, uplink services, videoconferencing services, satellite TV or radio program services. Teletron is one of the leading marketing/engineering contracting services organizations in the United Arab Emirates, providing comprehensive service to the telecommunication, construction, oil and gas industries as well as other utilities since its establishment in 1974.

Vitas Electronics Co.

P.O. Box 46213
Abu Dhabi
United Arab Emirates
Hrant Sarkissian, Managing Partner
Tel: (971) 2-314-631
Fax: (971) 2-310-242

Products distributed: Wisi MATV products, TFC coaxial cables, Gilbert Engineering connectors, and others in the near future; Services: installation of MATV, SMATV equipment.

UKRAINE



Government:	Republic (Member CIS)
Population:	52,015,000
Gross National Product:	US\$ 265 billion (1993 estimate)
Language(s):	Ukrainian, Russian
Religion:	Christian
Time Standard:	GMT+3
Currency Standard:	Hryvnia (N/A = US\$ 1)
Video Standard:	SECAM
Electrical System:	127/230 a.c., 50 Hz.
Telephone Country Code:	(7)

Major City Telephone Codes: None

INTELSAT REPRESENTATIVE:
KRRT

10 Dorogozhitskaya St.
252 112, Kiev 112
Ukraine
Mr. Alexej Yeliseyevich Karkenko
Vice President
Tel: 7-044-226-22-62
Fax: 7-044-440-87-22

INTELSAT OPERATIONS:
Ministry of Post & Telecommunications

Tel: (7) 44-226-2840

INTELSAT EARTH STATIONS:

L'VOV 1 - 325.5° E
L'VOV 2 - 60° E
L'VOV 3 - 335.5° E

SATELLITE COMPANIES:
Musson

Ukraine
Tel: (7) 69-233-490
Fax: (7) 69-238-081

Manufacturer of Inmarsat terminals

UNITED STATES

INTERNATIONAL SATELLITE OPERATORS:

(Note: for more detailed information on international satellite system operators, see the relevant chapters in the introductory section of this book.)

Columbia Communications Corporation

888 17th St. NW
12th Floor
Washington, DC 20006
Tel: (202) 429-9033
Fax: (202) 296-2962

INTELSAT

3400 International Drive NW
Suite 800
Washington, DC 20004
Tel: (202) 944-7236
Fax: (202) 944-8159

PanAmSat

One Pickwick Plaza
Greenwich, CT 06830
Tel: (203) 622-6664
Fax: (203) 622-9163

Private international satellite system and services. Providing video and data services, including full and part-time video, low and high speed data, VSAT radio and thin-route telephony. PAS-2 covering the Asia-Pacific Region will be launched in May of 1994.

Rimsat Ltd.

1911 Production Rd.
Fort Wayne, IN 46808
Tel: (219) 484-6474
Fax: (219) 484-4547

Tongasat

3585 Moultrie Avenue
San Diego, CA 92117
Tel: (619) 270-9996
Fax: (619) 270-4652

TRW Space and Technology Group

TRW Space and Defense
Commercial and International Program Development
Building R11, Room 2826
One Space Park
Redondo Beach, CA 90278
Tel: (310) 812-1193
Fax: (310) 814-1400

Unicom Satellite Corporation

P.O. Box 3057
Aspen, CO 81611
Tel: (303) 920-2400
Fax: (303) 920-2426

UPLINK PROVIDERS (WEST COAST):

Brewster International Gateway

1711 Old Highway 97
P.O. Box 1461
Brewster, WA 98812-1461
Jim Veeder

Tel: (509) 689-3444
Fax: (509) 689-3550

30m Standard A INTELSAT C-band antenna, with steerable coverage to the 180, 177, and 174° E Pacific Ocean Region satellites; 9m Standard B INTELSAT transmit only steerable to the 180, 177, 174 Pacific Ocean Region satellites.

Comsat World Systems

950 L'Enfant Plaza S.W.
Washington, D.C. 20024
Tel: (202) 863-6796
Fax: (202) 488-3814

U.S. PACIFIC ISLAND EARTH STATIONS

(AM SAMOA:)
PAGO PAGO - 174° E
(GUAM:) ANDERSEN 1 - 180° E
FINEGAYAN - 177° E
PULANTAT 2 - 174° E
PULANTAT 3 - 174° E
TANGUISSON PT - 183° E
(MARSHALL IS:)
EBEYE - 174° E
MAJURO - 174° E
(MICRONESIA:)
KOSRAE - 174° E
POHNPEI - 174° E
TRUK - 174° E
YAP - 174° E
(MIDWAY IS:)
MIDWAY ISLAND 1 - 174° E
(PALAU) PALAU - 174° E
(SAIPAN) SAIPAN 1 - 174° E

GE Americom

4 Research Way
Princeton, NJ 08540
John McGrath, Sales
Tel: (609) 987-4403

15.2m Standard A INTELSAT C-band antenna located at Point Reyes, CA fixed on 177° E. 21m, Standard AC-band antenna located at South Mountain, CA steerable to 180, 177, and 174° E.

GTE Hawaiian Tel

P.O. Box 2200
Honolulu, HI 96841
Mel Chow, Senior Consultant
Tel: (808) 546-4903
Fax: (808) 546-6031

EARTH STATIONS: 32m Standard A INTELSAT C-band antenna located at Sunset Beach, HI fixed on 174° E.

Hughes Communications

P.O. Box 92424
Los Angeles, CA 90009
Ray Lekowski, Director
Tel: (213) 607-4496
Fax: (213) 640-1265

EARTH STATION: 13m Standard A INTELSAT C-band antenna located at Fillmore, CA fixed on 180° E.

IDB Communications Group, Inc.

Washington Blvd.
Culver City, CA 90232-3380
Phil McInnes, Executive V.P.
Tel: (213) 870-9000
Fax: (213) 838-6374
Los Angeles Teleport
Tel: (213) 870-1100
Fax: (213) 837-7957

EARTH STATIONS: 13m Standard B INTELSAT C-band antenna located at Santa Paula, CA fixed on 180° E. 13m Standard B INTELSAT C-band antenna located at the Los Angeles Teleport fixed on 180° E. 6.2m Standard G INTELSAT C-band antenna fixed on POR 180. 8.1m Standard F2, Ku-band antenna located at Los Angeles Teleport, steerable. Transportable and flyaway antenna available upon request.

Keystone Communications

6430 Sunset Blvd
Suite 1400
Los Angeles, CA 90028
Mr. Charles Fedorko, V.P./GM West Coast
Tel: (213) 467-8900
Fax: (213) 465-8750

EARTH STATION: 15.5m Standard A C-band antenna located in Los Angeles, CA fixed on 180° E.

MCI International

Two International Drive
Rye Brook, NY 10573
Neil Hazzard, Director
Scott Miller, Manager
Tel: (703) 739-2683
Fax: (703) 739-2686

EARTH STATION: 15.2m Standard A C-band antenna located at Pt. Reyes, CA to be fixed on 177° E. 13m Standard B C-band antenna located at Redlands, CA fixed on 180° E.

U.S. INTELSAT PACIFIC OCEAN REGION (POR) EARTH STATION LOCATIONS:

Brewster, WA 174, 177, 180° E
Vallejo, CA 174, 177, 180° E
Point Reyes, CA 174, 177, 180° E
South Mountain, CA 174, 177, 180° E
Jamesburg, CA 174° E
Fillmore, CA 180° E
Redlands, CA 180° E
Santa Paula, CA 180° E
Triunfo Pass, CA 180° E
Los Angeles, CA 174, 180° E
Sylmar, CA 174, 180° E

COUNTRIES SERVICED BY ORBITAL POSITION:

INTELSAT 180° E Satellite

Australia
China (Taiwan)
French New Caledonia (Receive Only)
Hong Kong
Indonesia
Japan
Korea, South
New Zealand
Niue Island (Receive Only)
Philippines (Receive Only)
Singapore

INTELSAT 177° E Satellite

Australia
Japan
Philippines

INTELSAT 174° E Satellite

Australia
Brunei Darussalam (Receive Only)
China (Taiwan)
China (PRC)
Cook Islands (Receive Only)
Fiji
French New Caledonia
Guam
Hong Kong
Indonesia
Japan
Kiribati

Korea, South
Malaysia
New Zealand
Philippines
Singapore
Thailand
American Samoa (Receive Only)

Note: Any country within the above satellites' footprints may provide service depending on availability. Call Comsat TV Operations Center at (202) 863-6382 or Comsat Broadcast Services at (202) 863-6796 for more information.

SATELLITE COMPANIES:

Ajak Industries, Inc.

121 S. Robinson
Florence, Colorado USA 81226
Jim Berry, V.P. Marketing/Eng.
Matt Smith, Engineer

Products Manufactured: horizon to horizon mounts for antennas from 1 meter to 4 meters in size.

Ark Telecommunications, Inc.

124 Carmen Lane, Suite K
Santa Maria, CA 93454
Dr. S.S. Kamal, President & CEO
David R. Block, Manager of Bus. Dev.
Tel: (805) 349-2751
Fax: (805) 349-2750

Products manufactured: digital satellite communications products for a wide variety of applications including private business, government, rural telephony, disaster recovery, education, broadcast data, music distribution, cellular extension and LAN interconnection. Digital communication terminals, network management systems, data broadcast and music distribution products, enhanced VSAT systems and turnkey C-Band and Ku-Band earth stations.

Chaparral Communications

2450 North First St.
San Jose, CA 95131
Ernie Pacleb, Sales Mgr.
Tel: (408) 435-1530
Fax: (408) 435-1429

Manufacturer of a complete line of home satellite TV products.

Hoosier Satellite

1472 Wabash Avenue
P.P. box 3300
Terry Haute, IN 47803
Tel: (812) 235-6623
Fax: (812) 238-1299

Distributor of complete satellite receiving systems and antennas, receivers, LNBs and accessories. The company ships worldwide.

LNR Communications Inc.

180 Marcus Blvd.
Hauppauge, NY 11788-3795 USA
Dr. Frank Arams, V.P. of Marketing
Frances X. Kelly, Director of Marketing
Stuart Tittman, Director of Purchasing
Karen J. Robinson, Adv. Mgr.
Tel: (516) 273-7111
Fax: (516) 273-7119

Products manufactured: Ku and C-band hub earth stations fixed, transportable, and flyaway uplink systems, IDR/IBS upgrade subsystems, multiband trailerized earth stations, mobile voice communications systems, receivers, up/down converters, C, Ku, X-Band LNAs and a wide variety of other commercial satellite products.

Manhattan Microwave

Six Ferruzza Drive
Chestnutridge, NY 10987-6701
John Zelenka
Tel: (914) 426-0427
Fax: (914) 426-0455

Distributor of Inmarsat mobile satellite communications systems.

National ADL Enterprises

2216 Agate Ct., Unit B
Simi Valley, CA 93065
Gary Blachley
Tel: (805) 526-5249
Fax: (805) 584-0634

Manufacturer of satellite antenna feed systems.

Orbitron International

351 Peterson St.
Spring Green, WI 52588 USA
Frank Leach, President & CEO
Dave Johnson, International Sales Mgr.
Mike Kohl, Technical Director

Products manufactured: satellite antennas (2 - 7.3 meters in diameter); Products distributed: receivers, LNBs, feedhorns, antennas, accessories, positioners, cables, and modulators; Services: consulting and installation.

Paraclipse, Inc.

2271 29th Avenue East
P.O. Box 686
Columbus NE 68602-0686 USA
Norm Bruner, V.P. International Sales
Kelly Breedlove, Account Executive
Pam Kellogg, Sales Administrator
Dave Reinhart, Marketing Director
Tel: (402) 563-3625
Fax: (402) 564-2109

Products manufactured: HYDRO solid and perforated antennas - 1.8 & 2.4 m. CLASSIC antennas - formed mesh, trussed ribs - 3, 3.8, 4.5, and 4.8m. The 4.8 antenna comes with tower mount. ECLIPSE antennas - formed mesh - 3 & 3.8m UPS shippable. All Paraclipse antennas are C/Ku compatible. Paraclipse is a manufacturer of a complete range of satellite receive antennas. Residential and commercial. Mesh and solid antennas 1.8 to 4.8 meters in size. Packager of various satellite receive accessories.

Satellite Management International

5520 LBJ Freeway, Suite 250
Dallas, TX 75240 USA
Al Bond, President
Michael Bond, Mgr. International Development
Viveca Stock, Sales
Tel: (214) 392-0880
Fax: (214) 392-9310

Services: installation, management, and maintenance of domestic and international business television (BTV) networks, satellite based videoconferencing, the sale and brokerage of satellite transponder inventory (C & Ku-band) and video production. SMI has major international offices in London, England, and Sydney, Australia. The Sydney office serves all of Australia and the South Pacific.

TIW Systems, Inc.

1284 Geneva Drive
Sunnyvale, CA 94089
Dr. Rein Luik, President and CEO
Louis Becker, Executive Vice President
Rob Wellins, Director of Marketing
Tel: (408) 734-3900
Fax: (408) 734-9012

Products manufactured: antenna systems, antenna feed systems, antenna control and tracking systems, antenna positioners, TDMA terminals and SCPC modems. TIW Systems is a full service, turn-key supplier of antenna systems and earth stations for satellite communications: telemetry, tracking, control and monitoring (TTC&M); and scientific applications. Since its founding in 1976, TIW Systems has installed systems in twenty-two countries on five continents. TIW Systems is known for its precision large aperture antenna systems with monopulse or steptrack tracking systems. Systems supplier range in size from 9 to 34 meters in all the active communications bands. TIW's systems are in active use in the INTELSAT and INMARSAT networks. In 1994, TIW Systems ChinaSat TT&C Station will be operational to support China's DFH-3 satellites.

UZBEKISTAN



Government: Republic
 (Member CIS)
Population: 31,400,000
Gross National Product: US\$ 58 billion
 (1993 estimate)
Language(s): Uzbek, Russian
Religion: Muslim, with
 Orthodox Christian
 minority
Time Standard: GMT+5 or GMT+6
Currency Standard: Rouble
 (1.65 = US\$ 1)
Video Standard: SECAM
Electrical System:
Telephone Country Code: (7)
Major City Telephone Codes: None

INTELSAT REPRESENTATIVE:

Ministry of Communications

Tashkent 700000
 1, A. Tolstoj Str.
 Uzbekistan
 Mr. Kamidjan Rakhimov
Tel: (7) 3712-33-65-03/33-66-45
Fax: (7) 3712-33-16-95

INTELSAT EARTH STATION:

TASHKENT - 63° E

VIETNAM



Population: 70,430,000
Gross National Product: US\$ 19.2 billion
 (1993 estimate)
Language(s): Vietnamese and
 Chinese
Religion: Buddhist, with 7%
 Catholic minority
Time Standard: GMT+7
Currency Standard: Dong
 (10,598 = US\$ 1)
Video Standard: SECAM
Electrical System:
Telephone Country Code: (84)
Major City Telephone Codes: None
Number of TV Sets: 2,330,000

INTELSAT REPRESENTATIVE:

Vietnam Telecom International

(DGPT Hanoi)
 La Van Tam Park
 Ho Chi Minh City
 Viet Nam
 Mr. Van Minh Nguyen
 Assistant Managing Director
 Operations Representative VTN
Tel: 848-298-409
Fax: 848-296-051

INTELSAT EARTH STATIONS:

DA NANG - 60° E (VIETNAM TELECOM)
 HANOI 1 - 60° E (PHAN MANH QUANG)
 HANOI 2 - 63° E (PHAN MANH QUANG)
 SAIGON 1 - 174° E (NGUYEN THAI HOA)

SAIGON 2 - 60° E (NGUYEN THAI HOA)

INTERSPUTNIK EARTH STATIONS:

HANOI - 80° E

HO CHI MIN CITY - 80° E

BROADCAST ORGANIZATIONS:

Central TV Studios of Vietnam

58 Kuan Su

Hanoi

Tel: (84) 514-34

Television of Vietnam

59 Giang Vo

Hanoi

Tel: (84) 437-48

REGULATORY ORGANIZATION:

**Ministry of Communications, Transport,
Posts and Telegraphs**

80 Tran Hung Dao

Hanoi

Tel: (84) 540-75

Electrical System: 230 a.c., 50 Hz.

Telephone Country Code: (967)

Major City Telephone Codes:

Sanaa, Dhamar - 2

Hodeida - 3

Taizz - 4

INTELSAT REPRESENTATIVE:

Yemen International Telecomms Co. (LLC)

P.O. Box 168

Sana'a Yemen

Tel: 967-1-231-800/003/851/943

Fax: 967-1-225-606

INTELSAT OPERATIONS:

TELEYEMEN

Tel: 967-2-225591

INTELSAT EARTH STATIONS:

RAS BORADULI - 60° E (C&W)

SANAA 1 - 60° E (C&W)

SANAA 2 - 342° E (C&W)

INTERSPUTNIK EARTH STATION:

NEAR ADEN - 14° W

YEMEN



Government:

Republic

Population:

10,720,000

Gross National Product:

US\$ 9.6 billion
(1993 estimate)

Language(s):

Arabic

Religion:

Muslim

Time Standard:

GMT+3

Currency Standard:

Yemeni rial
(12.95 = US\$ 1)

Video Standard:

PAL

THE INCLINED ORBIT SATELLITE TRACKING GUIDEBOOK

by Mark Long & Jeffrey Keating

Today many of the world's international and domestic communications satellites occupy inclined orbits which must be tracked before any satellite earth station can continuously receive their signals. Do you fully understand all of the underlying principles behind satellite tracking technology? Now MLE takes the mystery out of this previously esoteric subject. The **Inclined Orbit Satellite Tracking Guidebook** explains:

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—**Bob Cooper**, former publisher of *Coop's Satellite Digest* & *CATJ* magazines

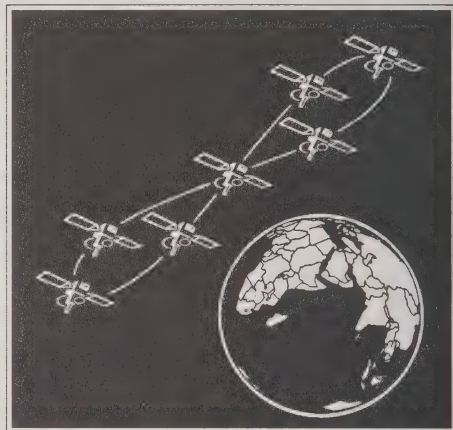
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Mark Long Enterprises, Inc.

150 North Federal Highway, Suite 230
Fort Lauderdale, Florida U.S.A. 33301
Tel: (305) 767-4687 Fax: (305) 767-6067

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BY MARK LONG & JEFFREY KEATING



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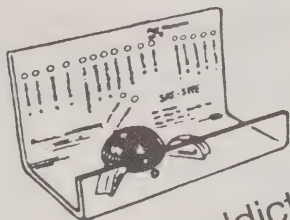
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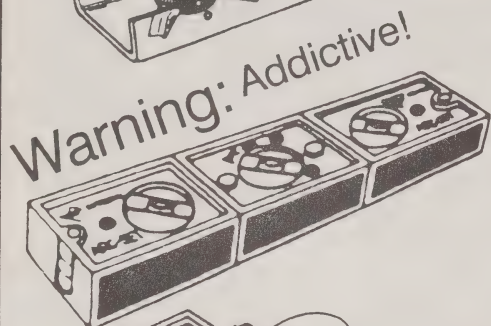


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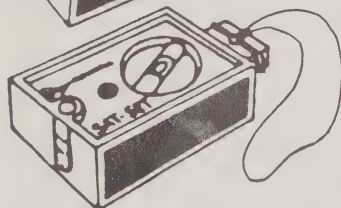
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70	70.43	78.52	48	48.70	55.12	38	38.70	44.03	28	28.61	32.68
65	65.52	73.32	47	47.70	54.02	37	37.69	42.90	27	27.59	31.53
60	60.59	68.06	46	46.71	53.92	36	36.69	41.78	26	26.58	30.38
55	55.66	62.72	45	45.71	51.82	35	35.68	40.65	25	25.57	29.23
54	54.67	61.64	44	44.72	50.72	34	34.67	39.52	20	20.47	23.45
53	53.67	60.56	43	43.72	49.61	33	33.67	38.38	15	15.37	17.62
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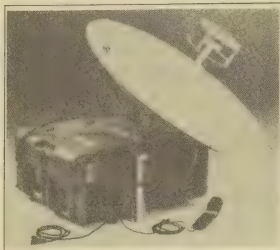
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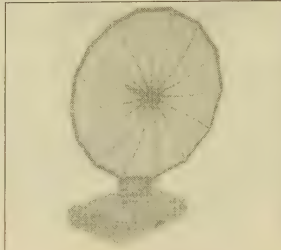
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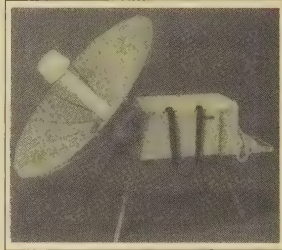
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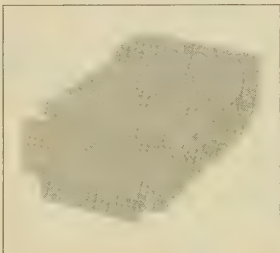
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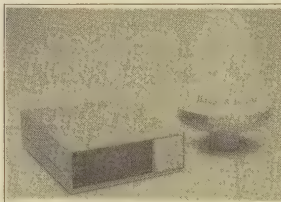
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PO Box 13024
Karachi 75350 Pakistan
Tel: (92) 21-430-261 Fax: (92) 21-455-9956

Lanna Supply Co. Ltd.

49/16 Huay Kaes Rd., A. Muang
Chiang Mai 50000 Thailand
Tel: (66) 53-212-727 Fax: (66) 53-217925

Lotus Cine Pvt Ltd.

D-402, Defence Colony
New Delhi 110024 India
Tel: (91) 11-462-4983 Fax: (91) 11-462-4708

Loxley (Bangkok) Ltd.

2 Soi Khemchai
Phaolyothin Rd.
Bangkok 10900 Thailand
Tel: (66) 2-512-2383 Fax: (66) 2-513-0659

MAF Telecom

P.O. Box 60811
Dubai, UAE

Matchmaster TV Sales Pty. Ltd.

2 Mimosa St.
Bexley, NSW 2207 Australia
Tel: (61) 2-587-4499 Fax: (61) 2-588-3137

Micro Vision

16 U G People's Park
Colombo 11 Sri Lanka
Tel: (94) 446519 Fax: (94) 448857, 448833

Modern Innovation Co. Ltd.

11/6 Sukhumvit 77
Bangkok 10250 Thailand
Tel: (66) 2-332-8320~1 Fax: (66) 2-332-3231

M/S Kassonics

Pinto Apartments
Pe Jose Vas Rd.
Vasco de Gama GOA, India
Tel: 2146, 3459 Fax: (91) 834-513-508

Nationwide Antenna Systems plc

17 Campbell St.
Bowlen Hills,
Brisbane, Queensland 4006 Australia
Tel: (61) 7-252-2947 Fax: (61) 7-252-8574

N.G. Electronics

B-249 Okhla Industrial Estate Phase I
New Delhi 110020 India
Tel: (91) 11-681-1625, 681-9162
Fax: (91) 11-681-9403

Opac Pty. Ltd

99-105 Boundary Rd.
Peakhurst NSW 2210 Australia
Tel: (61) 2-584-1233 Fax: (61) 2-584-1452

Orbitron International

351 Peterson St.
Spring Green, WI 52588 USA
Tel: (608) 588-2923 Fax: (608) 588-2257

Pacific Satellite International Ltd.

16/F, Block B, Cheung Lee Industrial Bldg.
9 Cheung Lee Street, Chai Wan
Hong Kong
Tel: (852) 898-1382 Fax: (852) 558-0406

Pan Asian Systems Ltd.

LG4 Cavendish Centre
23 Yip Hing Street
Wong Chua Hang, Hong Kong
Tel: (852) 873-9777 Fax: (852) 555-1589

Peter C. Lacey Services Ltd.

80 Dandenong Rd.
Frankston, VIC 3199 Australia
Tel: (61) 3-783-2388 Fax: (61) 3-783-5767

Pirimai Satellite Systems

165 Burwood Rd.
Burwood, Sydney, NSW Australia
Tel: (61) 2-747-2533 Fax: (61) 2-744-0047

Power Engineering

P.O. Box 1577
Dubai, UAE
Tel: (971) 4-212-545 Fax: (971) 4-234-127

PT Hartono Istana Teknologi

Jalan AIPDA K.S. Tubun IT/6
Jakarta 11410 Indonesia
Tel: (62) 21-548-6988, 530-1282
Fax: (62) 21-530-3856, 530-2225, 548-0141

PT Kwintercom

Jalan Gunung Sahari 96
Jakarta, Pusat
Indonesia
Fax: (62) 380-2030

PTR Group

112 Thirdthai Rd, Bookkalo
Thonburi, Bangkok 10600 Thailand
Tel: (66) 2-476-8627~8 Fax: (66) 2-476-8133

Samart International Co. Ltd.

Juthamard Bldg., 7th Floor
89/170 Phaholyothin Rd., Donmuang
Bangkok 10210 Thailand
Tel: (66) 2-589-1047, -6862
Fax: (66) 2-589-7855, -580-7350

Samart Satcom Co. Ltd.

37/1 Moo 2 Phaholyothin Rd.
Klong 1, Klong Laung
Pathumthanee 12120 Thailand
Tel: (66) 2-516-1188 Fax: (66) 2-516-8854

Satelland Co. Ltd

3rd Floor, C2 Bldg
290 Soi Japanese School, Rama IX Rd
Bangkok 10310 Thailand
Tel: (66) 2-318-5596~7 Fax: (66) 2-319-3508

Satellite Television Systems Pte. Ltd.

5001 Beach Road #03-98H
Golden Mile Complex
0719 Singapore

Satlink Limited

P.O. Box 3300
Manama Bahrain
Tel: (973) 536-000 Fax: (973) 336-666

Sea Sat Communication Co. Ltd.

537/38-9 Satupradit Complex, Satupradit Rd.
Bangpongpan, Yannawa
Bangkok 10120 Thailand
Tel: (66) 2-294-9159~61, 294-0814
Fax: (66) 2-294-9029

Sirius Co. Ltd.

126/67 Sikharin Place
Soi Ramkhamhaeng 24
Ramkhamhaeng Rd. Hua-Mark
Bangkok 10240 Thailand
Tel: (66) 2-300-4997 Fax: (66) 2-300-4309

Shobel Industrial Co. Ltd.

P.O. Box 530
Taoyuan, Taiwan
Tel: (886) 23-339-0156 Fax: (886) 3-336-7045

Skawol (Hong Kong) Ltd.

G/F, 12-14 Sam Chuk Street
San Po Kong, Kowloon, Hong Kong
Tel: (852) 351-6381 (12 lines)
Fax: (852) 351-5607 -5630 -8152

Skawol (Thailand) Co. Ltd.

48/4 Moo 7 Soi Saoyai
Bangmodpattana Rd.
Bangmoo Jomthong
Bangkok 10150 Thailand
Tel: (66) 2-428-0033 Fax: (66) 2-428-5477

Starsat Ltd. Partnership

21/3-4 Chaipayruk Rd. Mu 2
Talingshan, Bangkok 10170 Thailand
Tel: (66) 2-433-6474 Fax: (66) 2-435-9391

Star Vision

77 Bai Nigayam
Brooke Bond Rd.
Colmbatore 641 001
Tamil Nadu India
Tel: (91) 422-48373 Fax: (91) 422-212-957

Sun Satellite Television Services Ltd.

Unit 4601, Tower 1, Metroplaza
223 Hing Fong Rd., Kwai Fong, Hong Kong
Tel: (852) 422-7777 Fax: (852) 418-0626

Superior Communications

9th Floor, Wisma KLI
126, Jalan Bukit Bintang
55100 Kuala Lumpur Malaysia
Tel: (60) 3-242-8151 Fax: (60) 3-242-2052

Telectron

P.O. Box 2946
Abu Dhabi, United Arab Emirates
Tel: (971) 2-795-333 Fax: (971) 2-794-609

Telsat Communications Ltd.

P.O. Box 1537
Palmerston North, New Zealand
Fax: (64) 6-355-2141

Thai Network Center Co. Ltd.

222/25 Langluang Rd.
Bangkok 10100 Thailand
Tel: (66) 2-282-5286 Fax: (66) 2-281-6652

Thai Vasco (1977) Ltd.

287/23-24 Surawongse Rd.
Bangkrak, Bangkok Thailand
Tel: (66-2) 233-6594~5 Fax: (66-2) 237-5754

Unify Engineering Pte. Ltd.

Blk 9005 Tampines Street 93
#02-246 1852 Singapore
Tel: (65) 783-1111 Fax: (65) 783-7467

United Satellite & Radio Systems

257 Quirino Ave., Tambo
Paranaque, Metro Manila, Philippines
Tel: (63) 2-831-2676 Fax: (63) 2-831-2676

U.V.C. Satellite Systems

3-1-405, Adj. Lane "Sar Photo Studio"
Nimboli adda, Kachiguda
Hyderabad 500 027 India
Tel: 46789, 86934

Vict International Corp.

3F, No. 239, Chung Ching N. Rd.
Sec. 4, Taipei, Taiwan, ROC
Tel: (886) 2-8161926 Fax: (886) 2-816-1925

Videoshack Systems Ltd.

18-D Industrial Area
Rawalpindi Pakistan
Tel: (92) 51-861-955 Fax: (92) 51-862-217

Vitas Electronics Co.

P.O. Box 46213
Abu Dhabi, United Arab Emirates
Tel: (971) 2-314-631 Fax: (971) 2-310-242

Viva International

2nd Floor Zaman Plaza
The Mall, Lahore, Pakistan
Tel: (92) 42-723-6311 Fax: (92) 42-722-6311

Winscot Trading Pty Ltd.

276 Coventry Street
South Melbourne, VIC 3205 Australia
Tel: (612) 3-699-5740 Fax: (612) 3-690-9006

INSTALLATION COMPANIES

Antech Development Ltd.

M P Industrial Centre
1901-1906 Block B
18 Ka Yip Street
Chai Wan, Hong Kong
Tel: (852) 515-0191 Fax: (852) 898-2199

Installation of Satellite TV, SMATV, and CABD systems.

Audiosat

35 Mamre Rd., St. Marys,
NSW Australia
Tel: (61) 2-623-2368

Domestic Australian satellite and audio-visual installations.

Australian Satellite Services Pty. Ltd.

NSW 2250 Australia
Tel: (61) 4-325-0655
Fax: (61) 4-325-0654

Domestic Australian commercial satellite installations.

Azimuth (Far East) Ltd.

S Wang Jing Zhong Huan Nanlu
Chaoyang, Beijing 100105 PRC
Tel: (86) 1-436-1898 Fax: (86) 1-436-1891

Installation of SMATV, MATV, and Pay TV reception systems based from offices in Beijing, Hong Kong and Ulan Bator.

City Channels

Door No: 60-C, Robertson road
R.S. Puram (West)
Coimbatore 641002 India
Tel: (91) 422-852-342 Fax: (91) 422-852-342

Installation of TVRO antennas and CATV distribution systems.

HiTron Pty. Ltd.

P.O. Box 9209, Hohola, N.C.D.
Papua New Guinea
Tel: Port Moresby (675) 25-2311
Fax: Port Moresby (675) 25-0349

Installation of satellite TV and cable TV systems.

Nationwide Antenna Systems plc

17 Campbell St., Bowlen Hills,
Brisbane, Queensland 4006
Australia
Tel: (61) 7-252-2947 Fax: (61) 7-252-8574

Installation of earth stations and SMATV systems.

Orbitron International

351 Peterson St.
Spring Green, WI 52588 USA
Tel: (608) 588-2923 Fax: (608) 588-2257

Satellite Television Systems Pte. Ltd.

5001 Beach Road #03-98H
Golden Mile Complex
0719 Singapore
Turnkey design and installation of TVRO/SMATV systems for hotels, embassies, clubs, etc.

Satlink Limited

P.O. Box 3300
Manama, Bahrain
Tel: (973) 536-000 Fax: (973) 336-666

Installation of satellite earth stations and MMDS systems.

Telsat Communications Ltd.

P.O. Box 1537
Palmerston North, New Zealand
Fax: (64) 6-355-2141

Installation of TVRO systems covering New Zealand and all Pacific Islands.

United Satellite & Radio Systems

257 Quirino Ave., Tambo
Paranaque, Metro Manila, Philippines
Tel: (63) 2-831-2676 Fax: (63) 2-831-2676

Installation of TVRO, SMATV, and CATV systems.

Satellite Management International

5520 LBJ Freeway, Suite 250
Dallas, TX 75240 USA
Tel: (214) 392-0880 Fax: (214) 392-9310

Installation, management, and maintenance of domestic and international business television (BTV) networks, and satellite based videoconferencing systems.

Vitas Electronics Co.

P.O. Box 46213
Abu Dhabi, United Arab Emirates
Tel: (971) 2-314-631 Fax: (971) 2-310-242

Installation of MATV and SMATV equipment.

LAUNCH SERVICE COMPANIES - ASIA

Arianespace

Hibiya Central Building, 10F
1-2-9 Nishi-Shimbashi
Minato-ku
Tokyo 105 Japan
Tel: (81) 3-3592-2766 Fax: (81) 3-3592-2768

China Great Wall Industry Corp.

21 Huangsi Dajie
Xicheng Qu
Beijing 100011 PRC
Tel: (86) 1-837-2505, -2507 Fax: (86) 1-837-3155

National Space Development Agency of Japan (NASDA)

2-4-1 Hamamatsu-cho
Minato-ku
Tokyo 105 Japan
Tel: (81) 3-3435-6177 Fax: (81) 3-3433-0796

Elisra Ltd.

48 Mivtza Kadesh SE
Bene Beraq 51203
Israel

I.S.N. Corporation

Flat 2E Montieth Court
69 Montieth Road, Egmore
Madras 600 008 India
Tel: 826-8118

NEC Corporation

4035, Ikebe-cho, Midori-ku
Yokohama-shi, Kanagawa-ken
226 Japan
Tel: (81) 45-939-2200 Fax: (81) 45-939-2209

TIW Systems, Inc.

1284 Geneva Drive
Sunnyvale, CA 94089
Tel: (408) 734-3900 Fax: (408) 734-9012

ANTENNA POSITIONERS

Global Satellite System Pty. Ltd.

126 Union Road
Surrey Hills, VIC3127
Australia
Tel: (61) 3-888-5622 Fax: (61) 3-830-5846

TIW Systems, Inc.

1284 Geneva Drive
Sunnyvale, CA 94089
Tel: (408) 734-3900 Fax: (408) 734-9012

AUDIO RECEIVERS - DIGITAL/ANALOG

Comstream Corporation

Far East China Trade Centre
No. 1 Jianguomenwai Ave.
Suite 2309
Beijing, PRC
Tel: (86) 1-505-4824 Fax: (86) 1-505-4842

Global Satellite System Pty. Ltd.

126 Union Road
Surrey Hills, VIC3127
Australia
Tel: (61) 3-888-5622 Fax: (61) 3-830-5846

MANUFACTURERS - COMMERCIAL

ACCESSORIES

Andrew Antenna

153 Barry Rd.
Campbellfield, VIC 3061
Australia
Tel: (61) 3-357-9111 Fax: (61) 3-357-9097

AERONAUTICAL SATELLITE TERMINALS

ASI Technologies Pty Ltd.

80 Hargrove Avenue
Essendon Airport
Victoria 3041
Australia
Tel: (61) 3-374-1944 Fax: (61) 3-379-3789

ANTENNAS

Andrew Antenna

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Campbellfield, VIC 3061
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Tel: (61) 3-357-9111 Fax: (61) 3-357-9097

Microelectronics Technology Inc

No. 1 Innovation Rd. II
Hsinchu Science Based Industrial Park
Hsinchu 300 Taiwan ROC
Tel: (886) 35-773-335 Fax: (886) 35-777-121

DECODERS, VIDEO

Plessey Australia Pty. Ltd.

Faraday Park
Railway Rd.
Meadowbank, NSW 2114
Australia

FEEDHORNS

Andrew Antenna

153 Barry Rd.
Campbellfield, VIC 3061
Australia
Tel: (61) 3-357-9111 Fax: (61) 3-357-9097

FILTERS

C.V.A. (Cablevision Australia Pty. Ltd.)

2 Mimosa St.
Bexley, NSW 2207
Australia

INMARSAT TERMINALS

Anritsu Corporation

5-10-27
Minami-Azabu
Minato-ku
Tokyo 106 Japan
Tel: (81) 3-3446-1111 Fax: (81) 3-3440-2430

Furuno Electric Company Ltd.

9-52 Ashihara-cho
Nishinomiya 662 Japan
Tel: (81) 798-65-2111 Fax: (81) 798-65-4200

Japan Radio Co. Ltd (JRC)

Akasaka Twin Towers (Main), 17-22
Akasaka 2-chome
Minato-ku, Tokyo 107 Japan
Tel: (81) 3-3584-8744 Fax: (81) 3-3584-8891

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Hsinchu 300 Taiwan ROC
Tel: (886) 35-773-335 Fax: (886) 35-777-121

NEC Corporation

4035, Ikebe-cho, Midori-ku
Yokohama-shi, Kanagawa-ken
226 Japan
Tel: (81) 45-939-2200 Fax: (81) 45-939-2209

Toyocom Japan

International Operations Division
Onarimon Daiichi Bldg.
20-4 Nishi-Shimbashi 3-chome
Tokyo 105 Japan
Tel: (81) 3-3459-7320 Fax: (81) 3-3436-1434

LNBS

Hyunkwang Electronics & Telecom., Inc.

#188-6 Suyu 3 Dong
Dobong-ku
Seoul Korea
Tel: (82) 2-908-0861 Fax: (82) 2-900-1430

Japan Radio Co. Ltd (JRC)

Akasaka Twin Towers (Main), 17-22
Akasaka 2-chome
Minato-ku, Tokyo 107 Japan
Tel: (81) 3-3584-8744 Fax: (81) 3-3584-8891

LNK Communications Inc.

180 Marcus Blvd.
Hauppauge, NY 11788-3795 USA
Tel: (516) 273-7111 Fax: (516) 273-7119

Nichimen Corporation

11-1, Nihonbashi 3-chome
Chuo-Ku, Tokyo 103 Japan
Takumi Nambu, Electronics Section
Tel: (81) 3-3277-5962 Fax: (81) 3-3277-5870

RECEIVING SYSTEMS - COMMERCIAL

Electronic Services

Head Post Office Road
Paighat
Kerala 678001
India
Tel: (91) 491-26626, 55426

Beijing Asia Satellite Communications Technology Co., Ltd.

P.O. Box 2727
Beijing 100080 PRC
Tel: (86) 1-2562573 Fax: (86) 1-256-1264

Elisra Ltd.

48 Mivtza Kadesh SE
Bene Beraq 51203
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NEC Corporation

4035, Ikebe-cho, Midori-ku
Yokohama-shi, Kanagawa-ken
226 Japan
Tel: (81) 45-939-2200 Fax: (81) 45-939-2209

SPACECRAFT COMPONENTS

Mitsubishi Electric Corporation

8-1-1, Tsukagoshi-honmachi
Amagasaki, Hyogo 661 Japan
Tel: (81) 6-497-6080 Fax: (81) 6-497-6310

Mitsui & Company Ltd

2-1 Ohtemachi 1-Chome
Chiyoda-ku
Tokyo 100 Japan
Tel: (81) 3-3285-7335, 3-3285-7925
Fax: (81) 3-3285-9925

Remote Sensing Technology Ctr. of Japan

Uni-Roppongi Bldg., 7-15-17
Roppongi, Minatu-ku
Tokyo 106, Japan
Tel: (81) 3-3403-1761 Fax: (81) 3-3403-1766

TEST EQUIPMENT

Elisra Ltd.

48 Mivtza Kadesh SE
Bene Beraq 51203 Israel

Scientific MES-Technik Pvt. Ltd.

B-14, Industrial Estate
PoloGround, Indore 452003 India
Tel: (91) 731-33845 Fax: (91) 731-491641

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TIW Systems, Inc.

1284 Geneva Drive
Sunnyvale, CA 94089
Tel: (408) 734-3900 Fax: (408) 734-9012

UPLINKS

LNR Communications Inc.

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Hauppauge, NY 11788-3795 USA
Tel: (516) 273-7111 Fax: (516) 273-7119

NEC Corporation

4035, Ikebe-cho, Midori-ku
Yokohama-shi, Kanagawa-ken
226 Japan
Tel: (81) 45-939-2200 Fax: (81) 45-939-2209

VSAT EQUIPMENT

Ark Telecommunications, Inc.

124 Carmen Lane, Suite K
Santa Maria, CA 93454
Tel: (805) 349-2751 Fax: (805) 349-2750

Codan Pty. Ltd.

81 Graves Street
Newton, South Australia 5074
Australia
Tel: (61) 8-336-0311 Fax: (61) 8-337-6090

Elisra Ltd.

48 Mivtza Kadesh SE
Bene Beraq 51203
Israel

Global Satellite System Pty. Ltd.

126 Union Road
Surrey Hills, VIC3127 Australia
Tel: (61) 3-888-5622 Fax: (61) 3-830-5846

Hughes Network Systems Asia-Pacific

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Jalan Jenderal Sudirman KAV. 44-46
Jakarta 10210 Indonesia
Tel: (62) 21-571-3551/3/5 Fax: (62) 21-571-3554

Microelectronics Technology Inc

No. 1 Innovation Rd. II
Hsinchu Science Based Industrial Park
Hsinchu 300 Taiwan ROC
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TIW Systems, Inc.

1284 Geneva Drive
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Tel: (408) 734-3900 Fax: (408) 734-9012

MANUFACTURERS - TVRO/SMATV

ACCESSORIES

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5F No. 5 Lane 538,
Chung Cheng Rd.
Hsin Tien, Taiwan (ROC)
Tel: (886) 2-218-6286 Fax: (886) 2-218-1508

Chaparral Communications

2450 North First St.
San Jose, CA 95131
Tel: (408) 435-1530 Fax: (408) 435-1429

DX Trading Co., Ltd.

7th floor, DX Building East Annex
2-15 Hamazaki-Dori
Hyogo-ku
Kobe 652 Japan
Tel: (81) 78-652-0613 Fax: (81) 78-652-0683

Echosphere Corp. - Asian Division

Unit B block A
Wo Kee Hong Bldg.
585-609 Castle Peak Rd.
Kwai Chung, N.T.
Hong Kong
Tel: (852) 494-8823 Fax: (852) 494-8855

Echosphere International

16A Science Park Drive
#04-03 The Pascal
0511 Singapore
Tel: (65) 779-4166 Fax: (65) 779-6051

Tee-Comm Electronics, Inc.

Singapore Representative Office
315 Outram Rd.
#15-05 Tan Boon List Bldg.
Singapore 0316
Tel/Fax: (65) 227-7335

Wavetech (Private) Ltd.

C-31, KDA Scheme No. 1
Karachi 75350 Pakistan
Tel: (92) 21-447-779, 430-167, 430-168
Fax: (92) 21-454-5465, 241-5632

Wavetrak Pty. Ltd.

276 Coventry Street
South Melbourne, VIC 3205 Australia
Tel: (61) 3-690-6939 Fax: (61) 3-690-9006

ANTENNAS

Antech Development Ltd.

M P Industrial Centre
1901-1906 Block B
18 Ka Yip Street
Chai Wan, Hong Kong
Tel: (852) 515-0191 Fax: (852) 898-2199

ARIES Electronics Agencies Pvt Ltd.

201, Raghava Cottage
Dwarakapuri Colony, Panjagutta
Hyderabad, 500482 India
Tel: (91) 842-221-317 Fax: (91) 842-212891

CAD CAM Industries (HK) Ltd.

GPO Box 5264
28, Arbuthnot Road GIT
Central Hong Kong
Tel: (852) 524-2483 Fax: (852) 524-4730

Echosphere Corp. - Asian Division

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585-609 Castle Peak Rd.
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2450 North First St.
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Echosphere International

16A Science Park Drive
#04-03 The Pascal
0511 Singapore
Tel: (65) 779-4166 Fax: (65) 779-6051

High Communications

No. 217, Sharadi Colony
Basaveswaranagar
Bangalore 560 079 India
Tel: 335-1938 Fax: 221-6165

Innovative Technologies

91A Colombo Rd.
Piliyandala, Sri Lanka
Tel: (94) 78-60961 Fax: (94) 1-575-032, 810989

I.S.N. Corporation

Flat 2E Montieth Court
69 Montieth Road, Egmore
Madras 600 008 India
Tel: 826-8118

Jaeger Industrial Co.

2F, No. 4, Lane 7,
Pao Kao Rd., Hsin Tien City
Taipei 231 Taiwan
Tel: (886) 2-913-3422 Fax: (886) 2-917-8362

Kalyani Mercantile Co.

17, Garden Society
Gangapur Road
Nasik 422-002 India
Tel: (91) 253-70089 Fax: (91) 253-71600

Matchmaster TV Sales Pty. Ltd.

2 Mimosa St.
Bexley, NSW 2207 Australia
Tel: (61) 2-587-4499 Fax: (61) 2-588-3137

Micro Vision

16 U G People's Park
Colombo 11 Sri Lanka
Tel: (94) 446519 Fax: (94) 448857, 448833

Modern Communication and Broadcast Systems Pvt. Ltd.

93, Madhuban Towers, Ellisbridge,
Ahmedabad 380006 (Gujarat) India
Tel: 401821 Fax: 02712, 20585

M/S U.M.S. Factory (P.) Ltd

Gopal Bagh, 317 Avnashi Road
Colmbatore 641 018 India
Tel: (91) 422-213377/78 Fax: (91) 422-212760

Nagare Electronics

386, M.H.B. Colony
Satpur, Nasik 422 007 India
Tel: (91) 253-71206 Fax: (91) 253-77213

Nationwide Antenna Systems plc

17 Campbell St.
Bowlen Hills,
Brisbane, Queensland 4006
Australia
Tel: (61) 7-252-2947 Tel: (61) 7-252-8574

Nyron Communications, Inc.

2F., 521, Sec. 5, Chung Shan N. Rd.
Taipei 11120 Taiwan, ROC
Tel: (886) 2-882-1257 Fax: (886) 2-882-2857

Opac Pty. Ltd

99-105 Boundary Rd.
Peakhurst NSW 2210 Australia
Tel: (61) 2-584-1233 Fax: (61) 2-584-1452

Orbitron International

351 Peterson St.
Spring Green, WI 52588 USA
Tel:(608) 588-2923 Fax: (608) 588-2257
(See advertisement on following page.)

Pace Micro Technology (Asia)

Suite 113 Central Bldg.
1 Peddler St.,
Central Hong Kong
Tel: (852) 841-7809 Fax: (852) 841-7722

Paraclipse, Inc.

2271 29th Avenue East
P.O. Box 686
Columbus NE 68602-0686 USA
Tel: (402) 563-3625 Fax: (402) 564-2109

Samart Engineering Co. Ltd.

59 Moo 2 Phaholyothin Rd.
Puthumthanee 12120 Thailand

Samart Satcom Co. Ltd.

37/1 Moo 2 Phaholyothin Rd.
Klong 1, Klong Laung
Pathumthanee 12120 Thailand
Tel: (66) 2-516-1188 Fax: (66) 2-516-8854

S.K. Products

"Shiyani Chambers"
Kothariya Main Road
Rajkot 360002 India
Tel: 83399

Shobel Industrial Co. Ltd.

P.O. Box 530
Taoyuan, Taiwan
Tel:(886) 23-339-0156 Fax: (886) 3-336-7045

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Model	Diam.		Focal length		F/D ratio	dBI gain		GHZ
	Ft.	M	in.	cm		4.2	12.2	
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SX8.5	8.3	2.5	36.0	91.4	.36	39.2	46.6	
SX10	10.0	3.0	36.0	91.4	.30	40.5	48.2	
C10	10.0	3.0	36.0	91.4	.30	40.5	48.2	
SST8	7.8	2.4	32.0	80.6	.34	38.5	46.4	
SST10	10.0	3.0	43.0	108.1	.36	40.5	48.3	
SX12	11.7	3.6	50.4	128.0	.36	42.2	49.5	
O16	16.0	4.9	57.6	146.3	.30	44.8	52.1	
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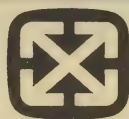
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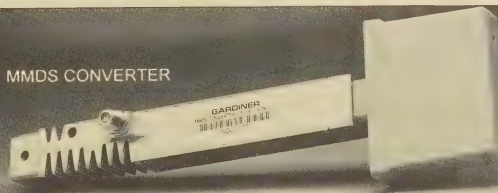
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 India

Global Information Systems, Inc.

GDVIC VVC Prospect Mira
 129223, Moscow,
 Russia
 Tel: (7) 95-181-4209
 Int. Tel/Fax: (7) 502-221-5008

Operator and Marketing Agent for the proposed
 GloboStar Satellite System using Russian "Koupon"
 satellites beginning in 1994.

GloboStar Satellite Systems Ltd.

1408 Prince's Bldg., 10 Chater Rd.
 Central, Hong Kong
 Tel: (852) 537-9265
 Fax: (852) 845-9175

Subsidiary of Global Information Systems, Inc.,
 operator of the forthcoming GloboStar satellite sys-
 tem to be launched by the Russians beginning in
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Indian Space Research Organization (ISRO)

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 Fax: (91) 812-332-292

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 Fax: (202) 944-8159

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 P.O. B. 17185, Tel-Aviv 61171
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 Fax: (972) 3-642-2298

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 4-3-1 Toranomom Minato-ku
 Tokyo 105 Japan
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Fax: (81) 3-3234-9036

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TRW Space and Defense
Commercial and International Program Development
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Redondo Beach, CA 90278
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Fax: (310) 814-1400

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Aspen, CO 81611
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Fax: (303) 920-2426

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Fax: (81) 3-5565-0044/0006

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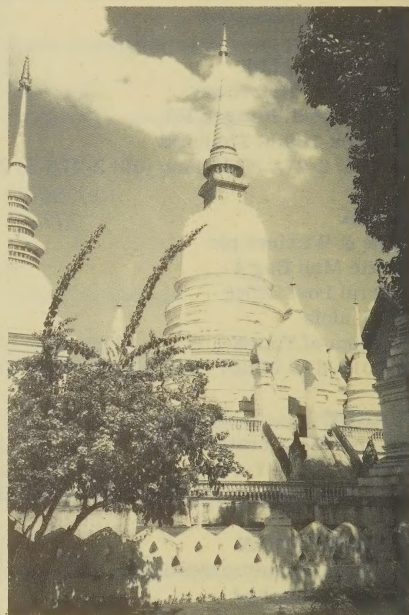
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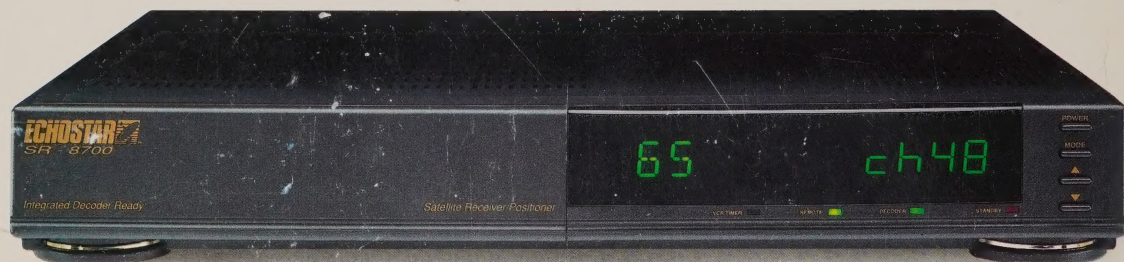
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